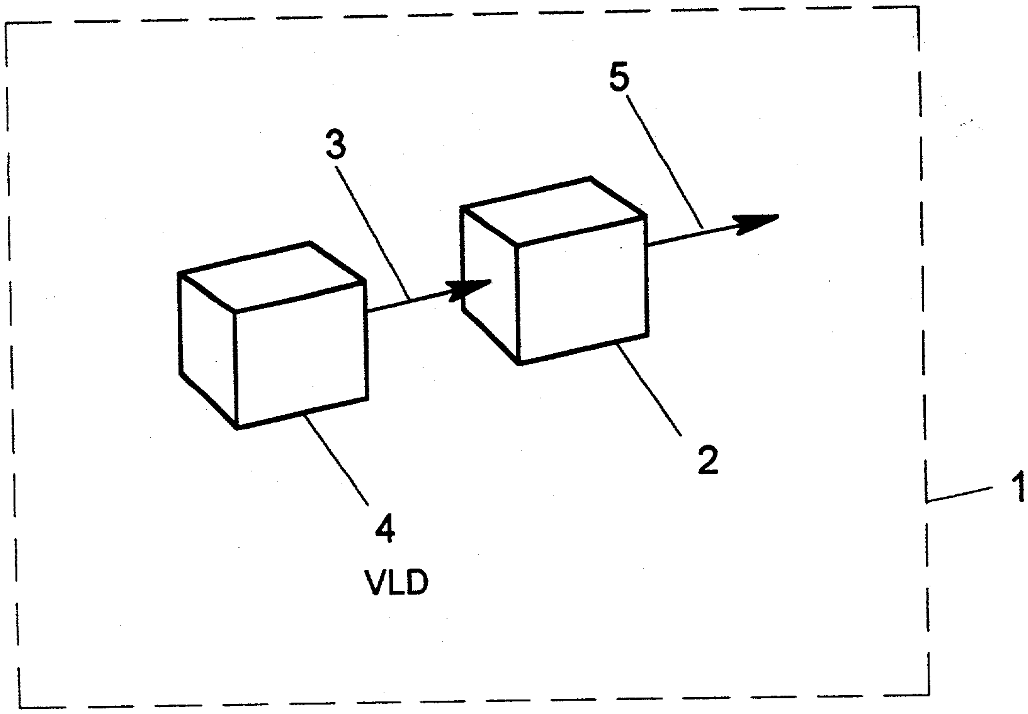

5
3
2
1
4
VLD

FIG. 1

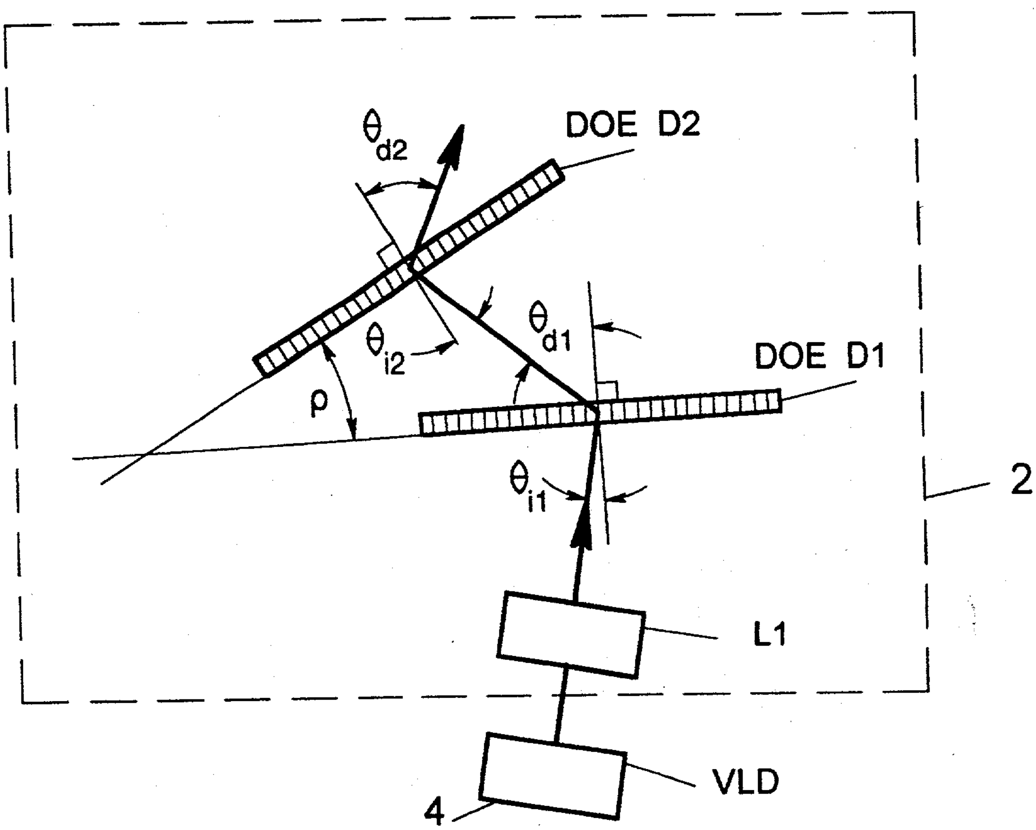

θ_{d2}
DOE D2
θ_{d1}
θ_{i2}
DOE D1
ρ
θ_{i1}
2
L1
VLD
4

FIG. 1A

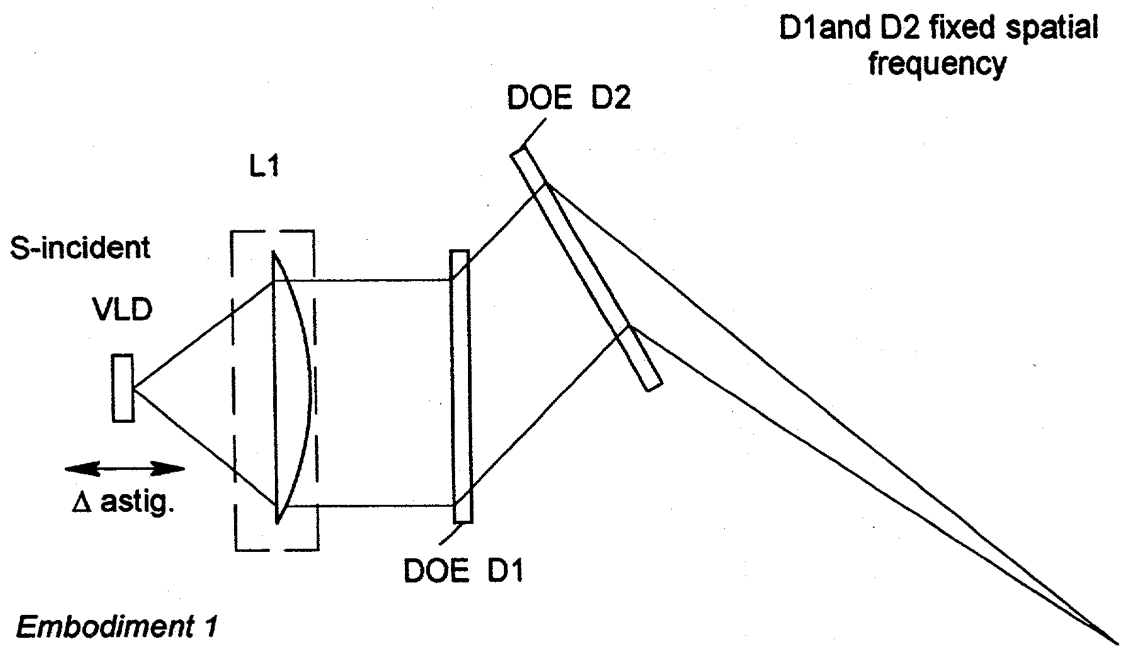

D1and D2 fixed spatial frequency
DOE D2
L1
S-incident
VLD
Δ astig.
DOE D1
Embodiment 1

FIG. 2A

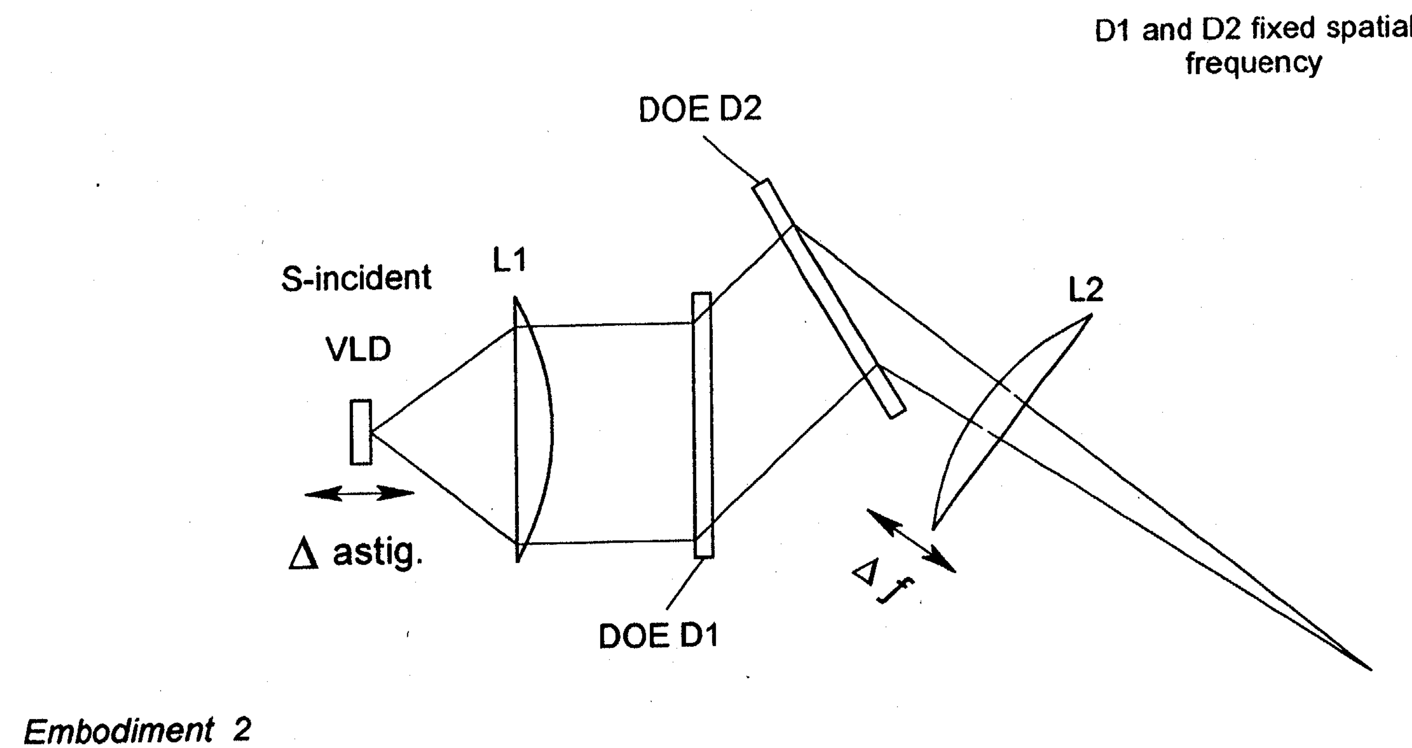
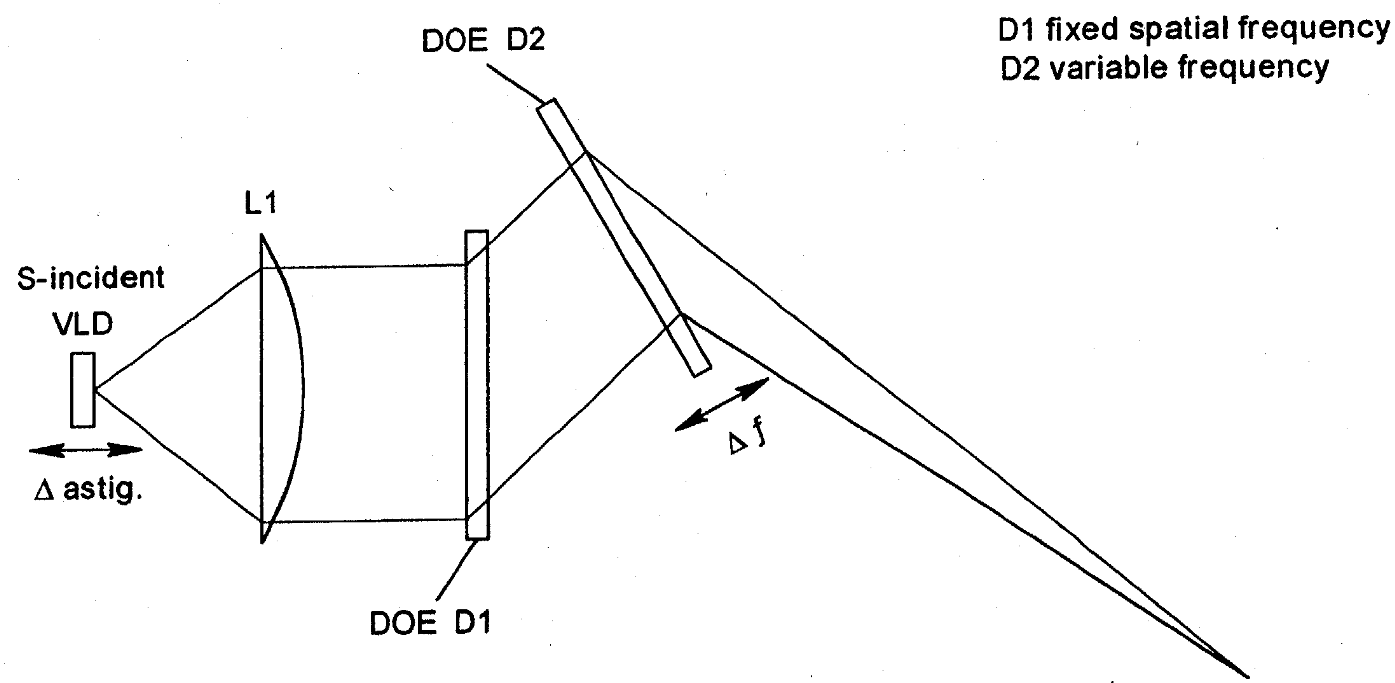

D1 and D2 fixed spatial frequency
DOE D2
S-incident
L1
L2
VLD
Δ astig.
Δ f
DOE D1
Embodiment 2

FIG. 2B



Embodiment 3

FIG. 2C

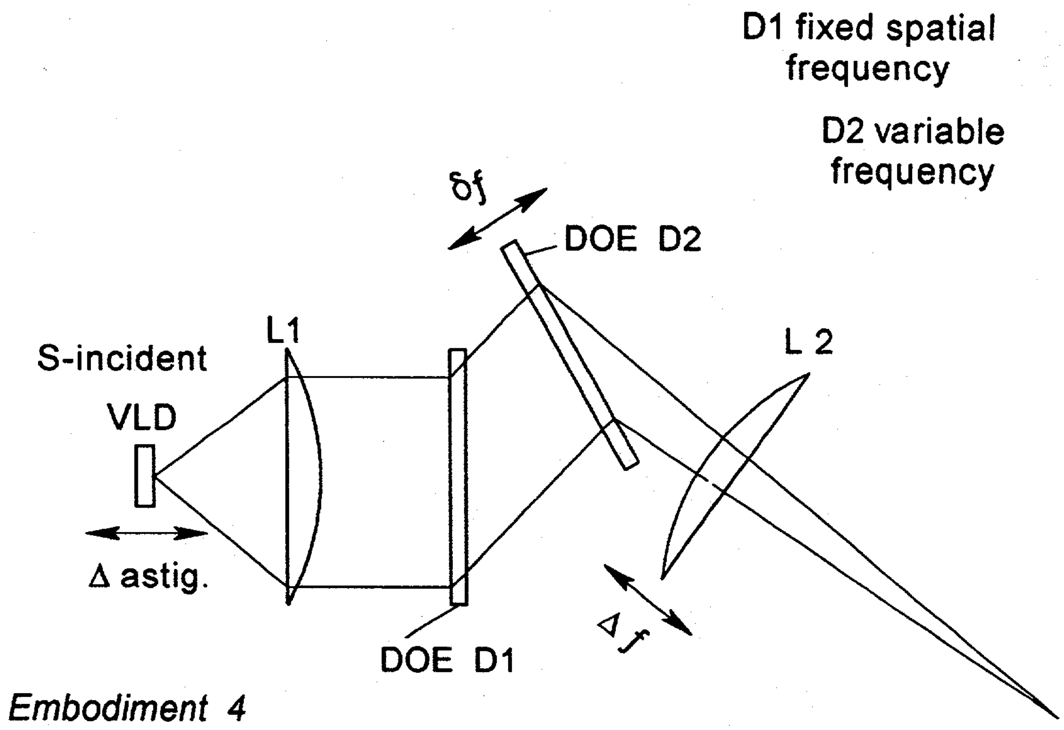

D1 fixed spatial
frequency
D2 variable
frequency
δf
DOE D2
L1
S-incident
VLD
L 2
Δ astig.
Δf
DOE D1
Embodiment 4

FIG. 2D

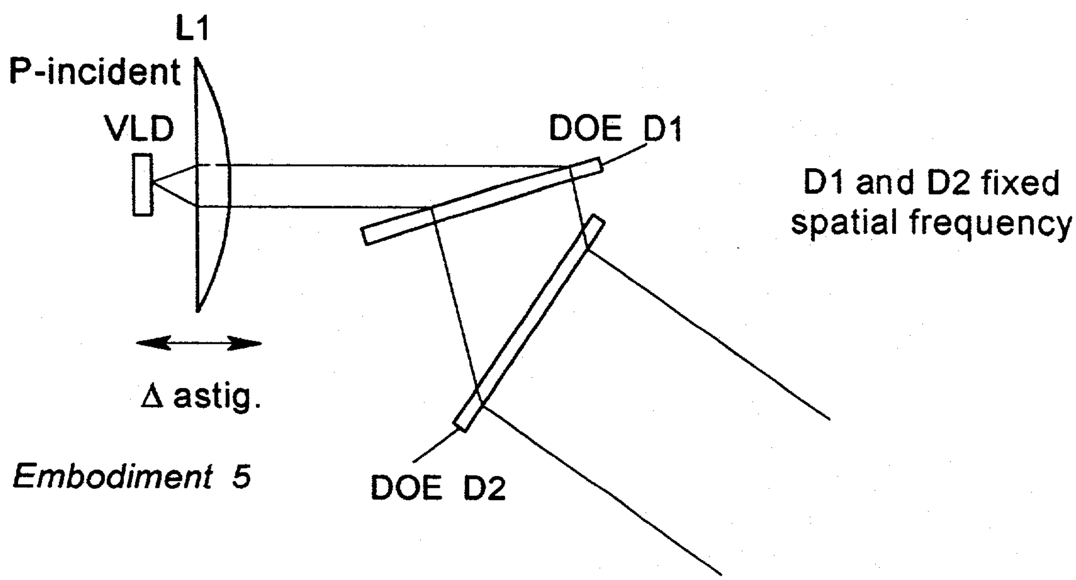

L1
P-incident
VLD
DOE D1
D1 and D2 fixed
spatial frequency
Δ astig.
Embodiment 5
DOE D2

FIG. 2E

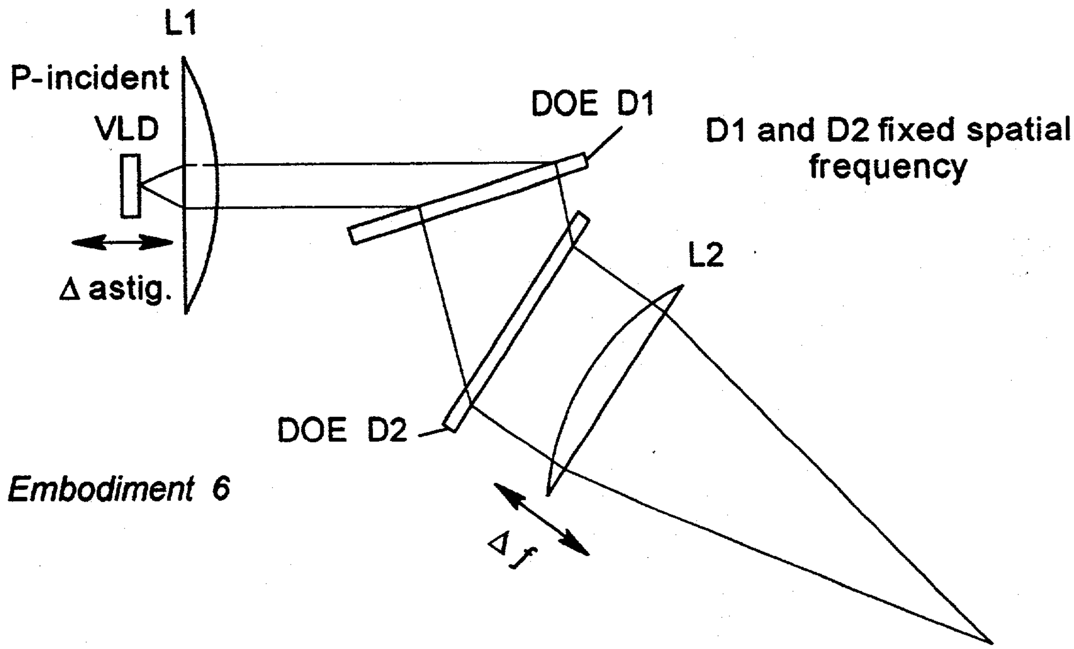

L1
P-incident
VLD
Δ astig.
DOE D1
D1 and D2 fixed spatial frequency
L2
DOE D2
Embodiment 6
Δ f

FIG. 2F

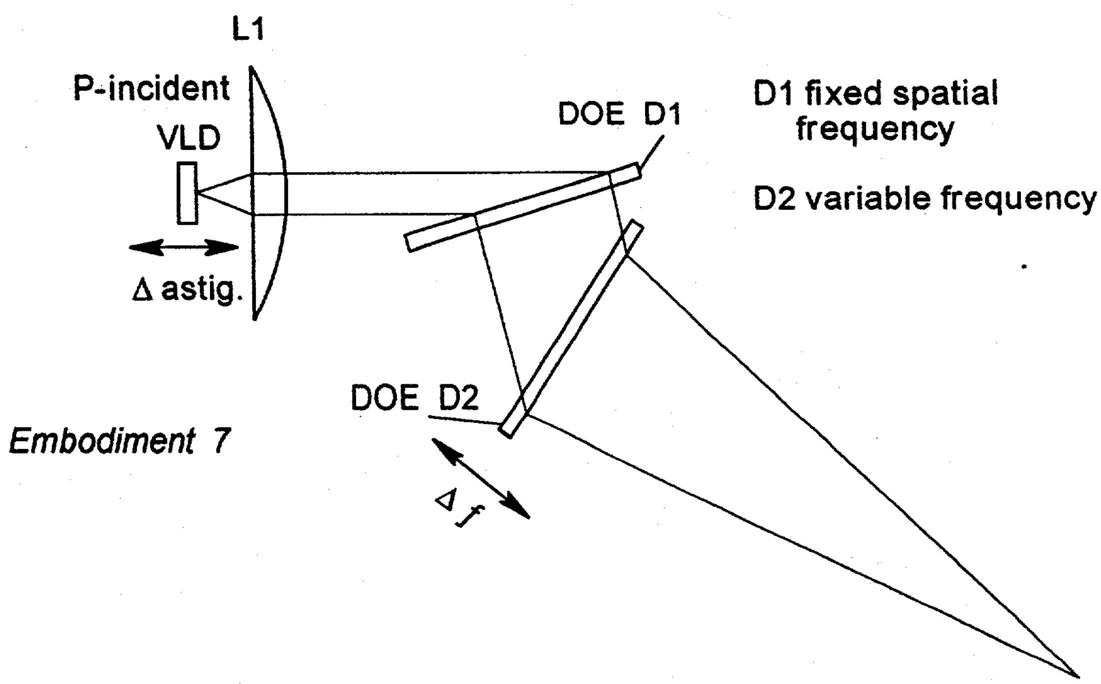

L1
P-incident
VLD
Δ astig.
DOE D1
D1 fixed spatial frequency
D2 variable frequency
DOE D2
Embodiment 7
Δ f

FIG. 2G

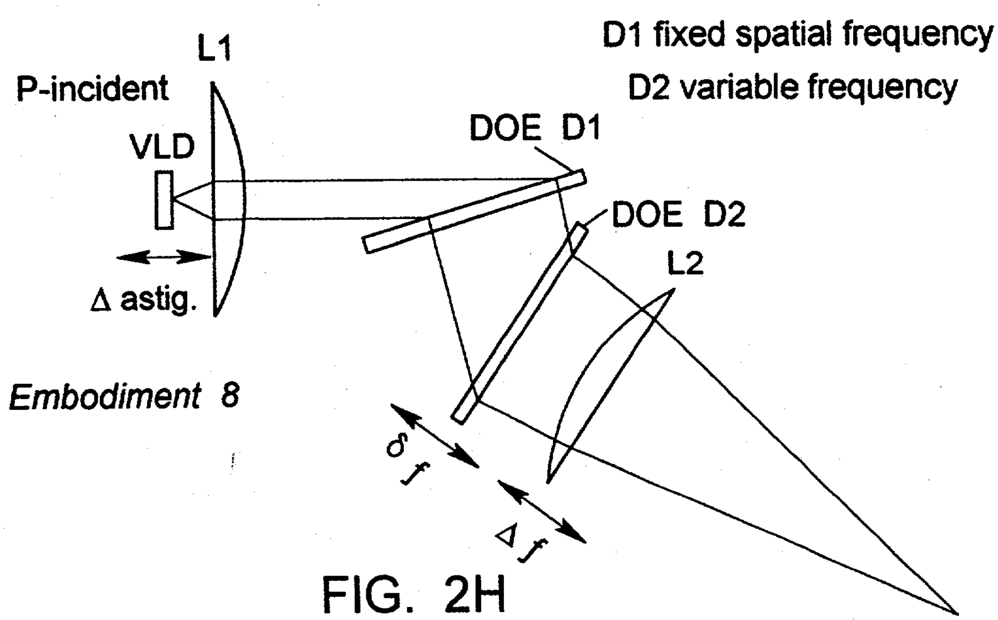

D1 fixed spatial frequency
D2 variable frequency
L1
P-incident
VLD
DOE D1
DOE D2
L2
Δ astig.
Embodiment 8
δ f
Δ f

FIG. 2H

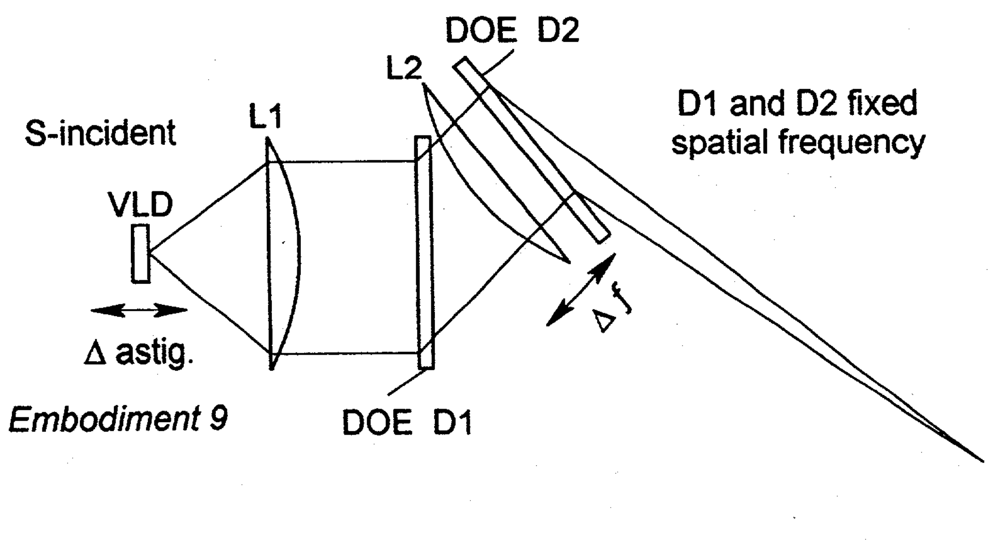

DOE D2
L2
D1 and D2 fixed
spatial frequency
S-incident
L1
VLD
Δ astig.
Embodiment 9
DOE D1
Δ f

FIG. 2I

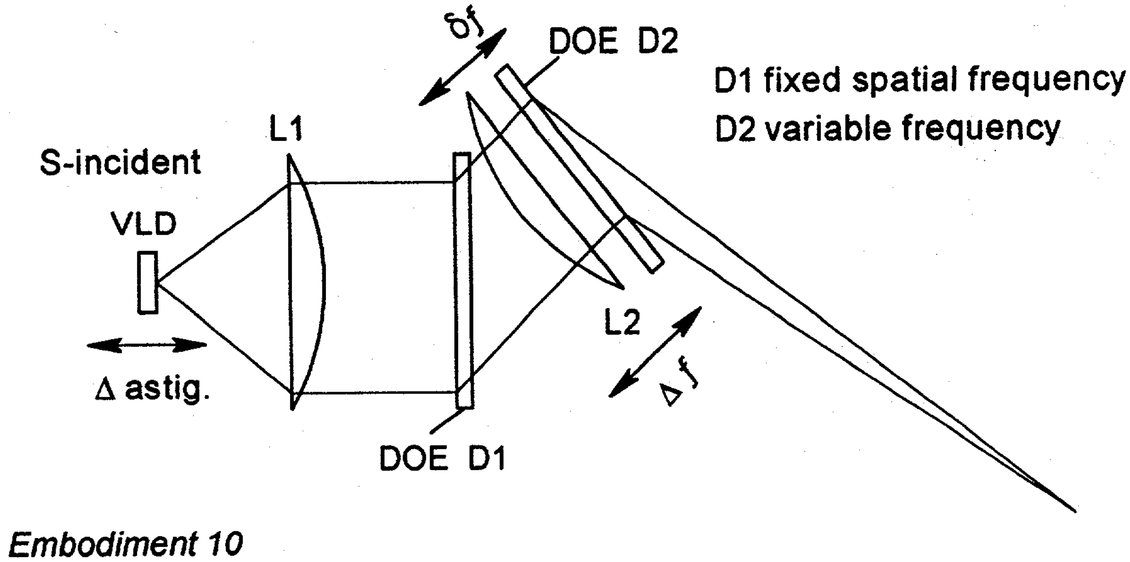

δf
DOE D2
D1 fixed spatial frequency
D2 variable frequency
L1
S-incident
VLD
L2
Δ astig.
Δ f
DOE D1
Embodiment 10

FIG. 2J

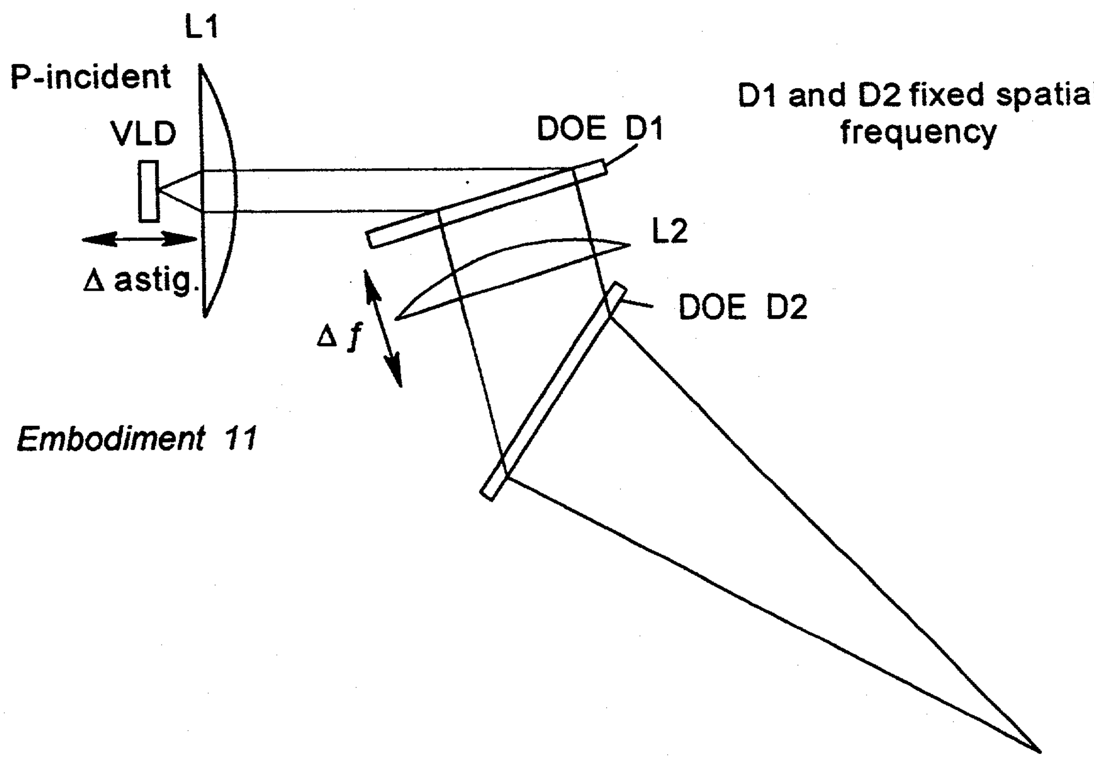

L1
P-incident
VLD
D1 and D2 fixed spatial frequency
DOE D1
L2
Δ astig.
DOE D2
Δ f
Embodiment 11

FIG. 2K

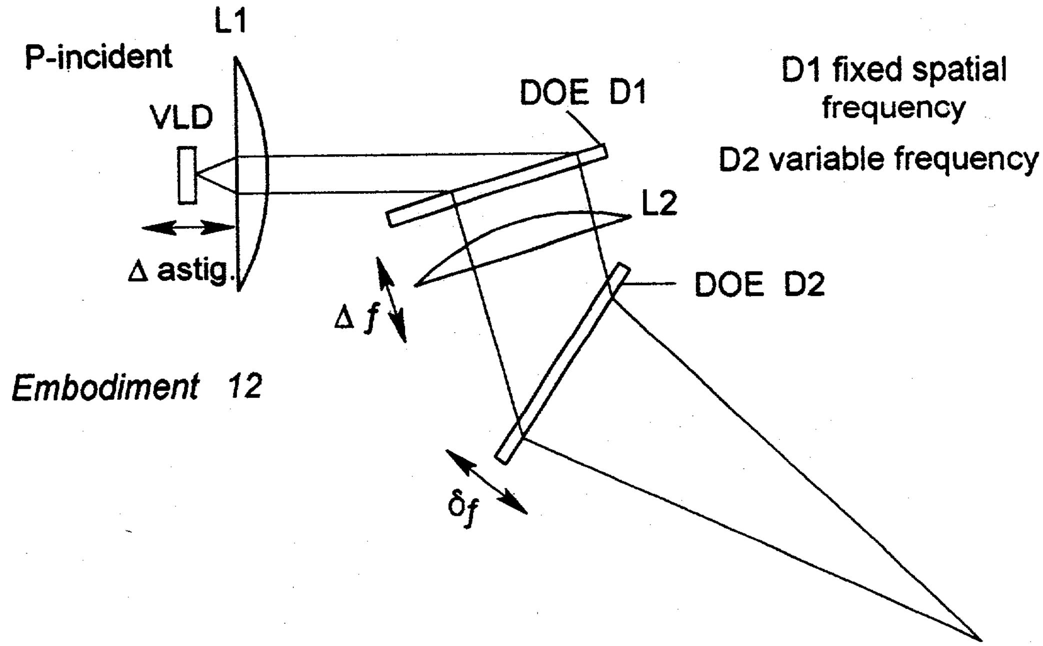

L1
P-incident
VLD
Δ astig.
DOE D1
D1 fixed spatial frequency
D2 variable frequency
L2
DOE D2
Δ f
Embodiment 12
δf

FIG. 2L

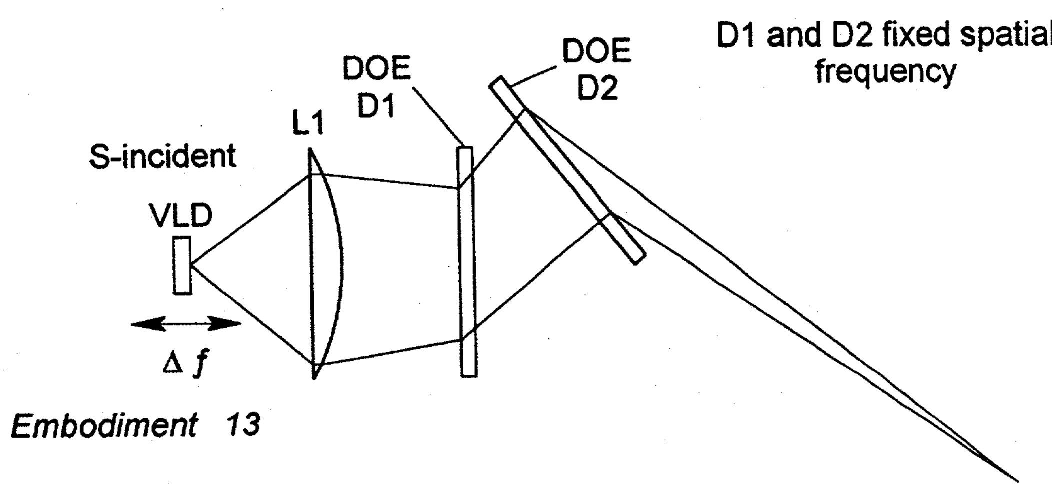
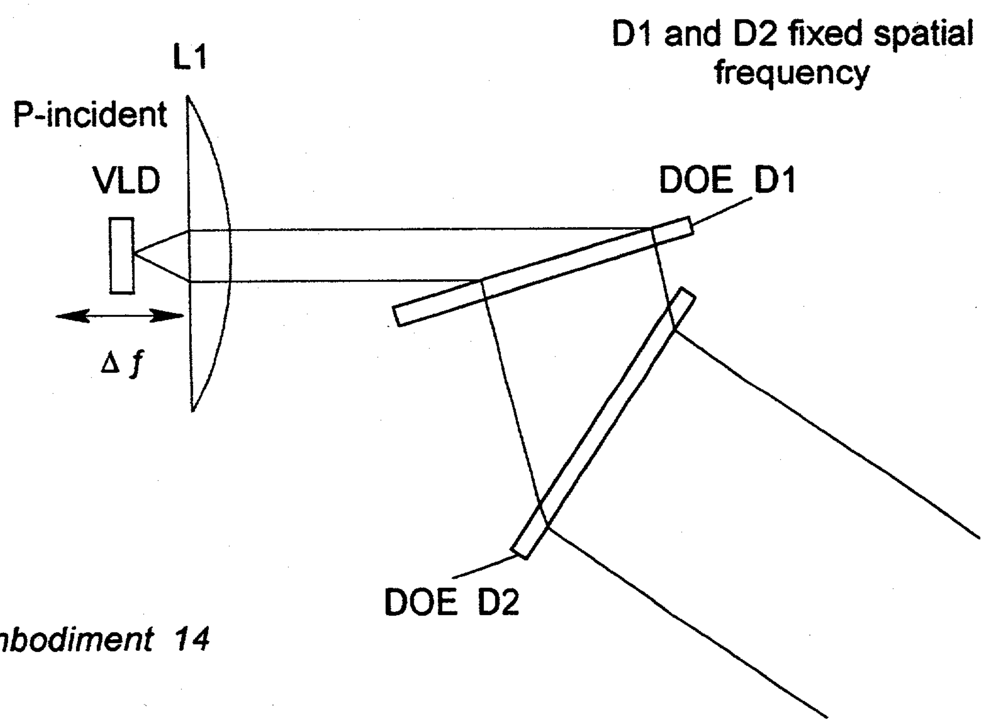

D1 and D2 fixed spatial frequency
DOE D1
DOE D2
L1
S-incident
VLD
Δ f
Embodiment 13

FIG. 2M



Embodiment 14

FIG. 2N

ESTABLISH END-USER REQUIREMENTS FOR LASER BEAM PRODUCING MODULE UNDER DESIGN (e.g. WORKING DISTANCE, DEPTH OF FIELD, BAR CODE RESOLUTION, ETC.) — A

↓

DETERMINE THE NECESSARY SPOT-SIZE, ASPECT-RATIO, AND WAIST-DIMENSIONS OF THE OUTPUT LASER BEAM IN ORDER TO SCAN THE DESIRED CLASS OF BAR CODE SYMBOLS — B

↓

DETERMINE THE FOCAL DISTANCE OF THE LASER BEAM PRODUCING MODULE (i.e. SYSTEM) f_{MODULE} WHICH PROVIDES THE DESIRED DEPTH OF FIELD FOR THE END-USER SCANNING SYSTEM AT THE DESIRED WORKING DISTANCE — C

↓

USING THE GAUSSIAN BEAM PROPOGATION MODEL, DETERMINE THE REQUIRED BEAM SIZE AND ASPECT-RATIO LEAVING THE LASER BEAM PRODUCING SYSTEM UNDER DESIGN — D

↓

A

FIG. 3A1

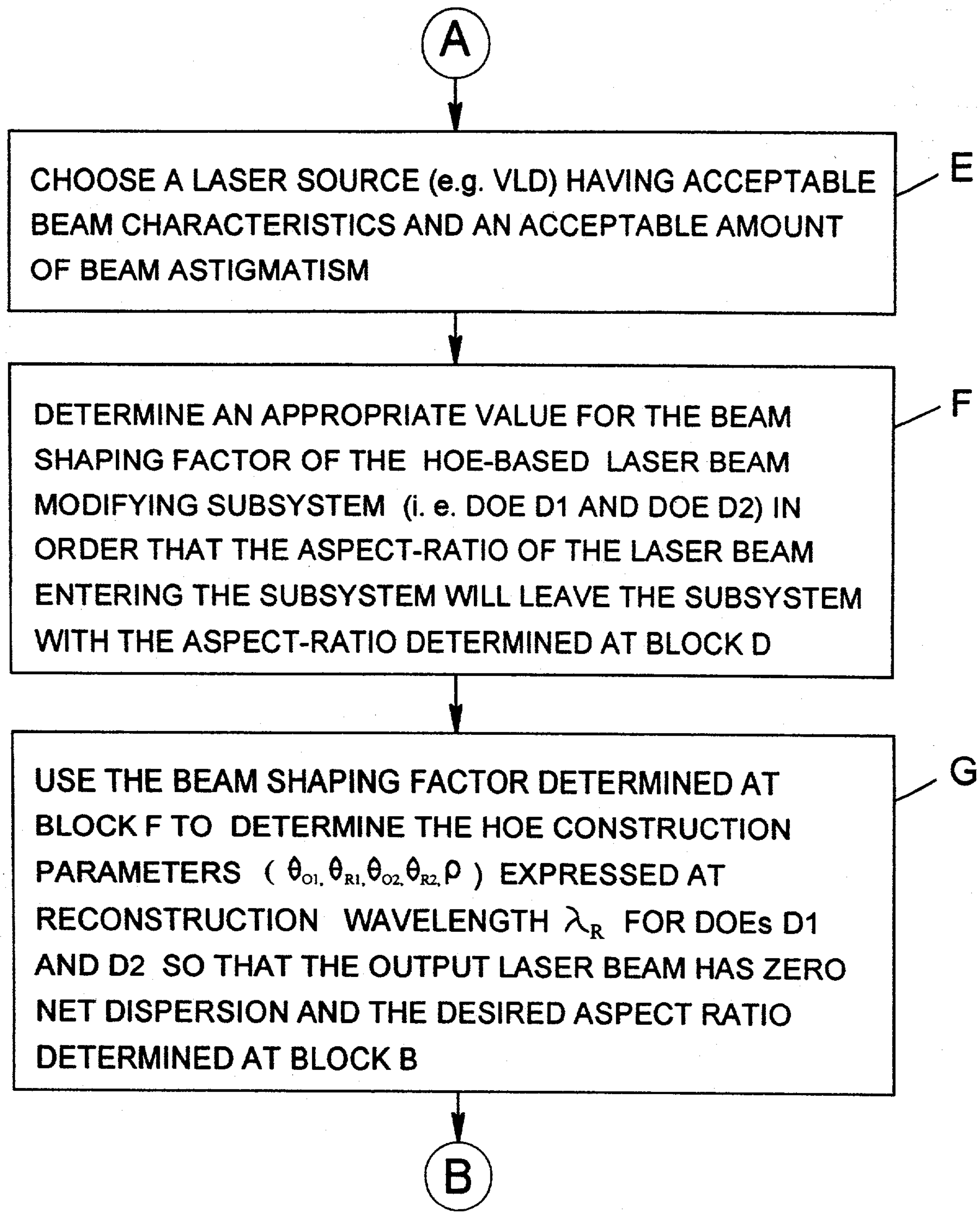

A
CHOOSE A LASER SOURCE (e.g. VLD) HAVING ACCEPTABLE BEAM CHARACTERISTICS AND AN ACCEPTABLE AMOUNT OF BEAM ASTIGMATISM
E
DETERMINE AN APPROPRIATE VALUE FOR THE BEAM SHAPING FACTOR OF THE HOE-BASED LASER BEAM MODIFYING SUBSYSTEM (i. e. DOE D1 AND DOE D2) IN ORDER THAT THE ASPECT-RATIO OF THE LASER BEAM ENTERING THE SUBSYSTEM WILL LEAVE THE SUBSYSTEM WITH THE ASPECT-RATIO DETERMINED AT BLOCK D
F
USE THE BEAM SHAPING FACTOR DETERMINED AT BLOCK F TO DETERMINE THE HOE CONSTRUCTION PARAMETERS ($\theta_{O1}, \theta_{R1}, \theta_{O2}, \theta_{R2}, \rho$) EXPRESSED AT RECONSTRUCTION WAVELENGTH λ_R FOR DOEs D1 AND D2 SO THAT THE OUTPUT LASER BEAM HAS ZERO NET DISPERSION AND THE DESIRED ASPECT RATIO DETERMINED AT BLOCK B
G
B

FIG. 3A2

B

DETERMINE THE DISTANCE FROM THE VLD TO FIRST LENS ELEMENT L1, WHICH PRODUCES AN OUTPUT LASER BEAM HAVING THE DESIRED BEAM SIZE DETERMINED AT BLOCK D — H

DETERMINE THE FOCAL LENGTH OF LENS ELEMENT L1 THAT PRODUCES AN OUTPUT LASER BEAM HAVING THE DESIRED FOCAL LENGTH DETERMINED AT BLOCK C — I

FIG. 3A3

ESTABLISH END-USER REQUIREMENTS FOR LASER BEAM PRODUCING MODULE UNDER DESIGN (e.g. WORKING DISTANCE, DEPTH OF FIELD, BAR CODE RESOLUTION, ETC.) A

DETERMINE THE NECESSARY SPOT-SIZE, ASPECT-RATIO, AND WAIST DIMENSION OF THE OUTPUT LASER BEAM IN ORDER TO SCAN THE DESIRED CLASS OF BAR CODE SYMBOLS B

DETERMINE THE FOCAL DISTANCE OF THE LASER BEAM PRODUCING MODULE (i.e. SYSTEM) f_{MODULE} WHICH PROVIDES THE DESIRED DEPTH OF FIELD FOR THE END USER SCANNING SYSTEM AT THE DESIRED WORKING DISTANCE C

USING THE GAUSSIAN BEAM PROPOGATION MODEL, DETERMINE THE REQUIRED BEAM SIZE AND ASPECT- RATIO LEAVING THE LASER BEAM PRODUCING SYSTEM UNDER DESIGN D

A

FIG. 3B1

A

CHOOSE A LASER SOURCE (e.g. VLD) HAVING ACCEPTABLE BEAM CHARACTERISTICS AND AN ACCEPTABLE AMOUNT OF BEAM ASTIGMATISM

E

DETERMINE AN APPROPRIATE VALUE FOR THE BEAM SHAPING FACTOR OF THE HOE-BASED LASER BEAM MODIFYING SUBSYSTEM (i. e. DOE D1 AND DOE D2) IN ORDER THAT THE ASPECT-RATIO OF THE LASER BEAM ENTERING THE SUBSYSTEM WILL LEAVE THE SUBSYSTEM WITH THE ASPECT-RATIO DETERMINED AT BLOCK D

F

USE THE BEAM SHAPING FACTOR DETERMINED AT BLOCK F TO DETERMINE THE HOE CONSTRUCTION PARAMETERS (θ_{O1}, θ_{R1}, θ_{O2}, θ_{R2}, ρ) EXPRESSED AT RECONSTRUCTION WAVELENGTH λ_R FOR HOEs H1 AND H2, SO THAT THE OUTPUT LASER BEAM HAS ZERO NET DISPERSION AND THE DESIRED ASPECT-RATIO DETERMINED AT BLOCK B

G

B

FIG. 3B2

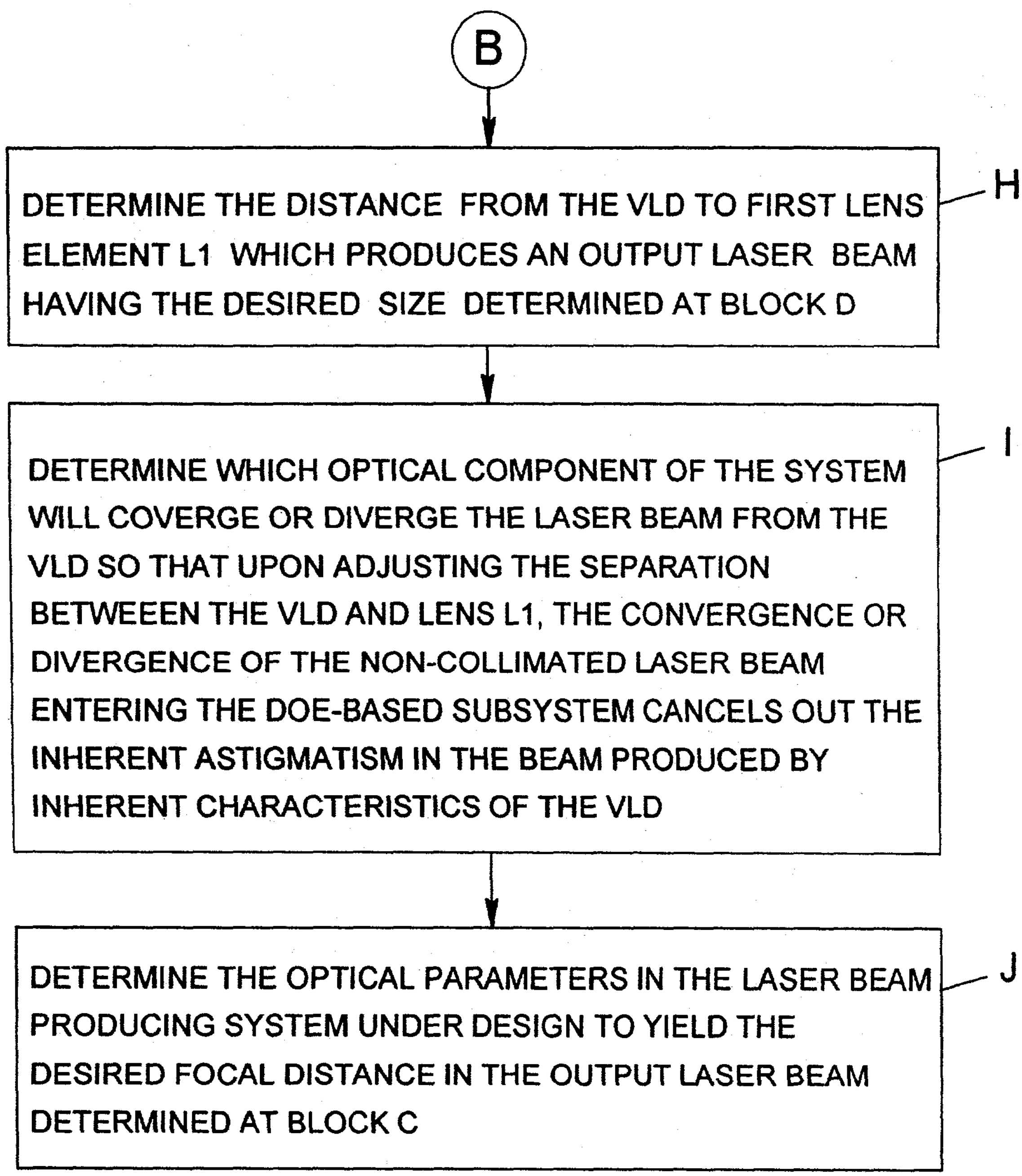

B
DETERMINE THE DISTANCE FROM THE VLD TO FIRST LENS ELEMENT L1 WHICH PRODUCES AN OUTPUT LASER BEAM HAVING THE DESIRED SIZE DETERMINED AT BLOCK D
H
DETERMINE WHICH OPTICAL COMPONENT OF THE SYSTEM WILL COVERGE OR DIVERGE THE LASER BEAM FROM THE VLD SO THAT UPON ADJUSTING THE SEPARATION BETWEEEN THE VLD AND LENS L1, THE CONVERGENCE OR DIVERGENCE OF THE NON-COLLIMATED LASER BEAM ENTERING THE DOE-BASED SUBSYSTEM CANCELS OUT THE INHERENT ASTIGMATISM IN THE BEAM PRODUCED BY INHERENT CHARACTERISTICS OF THE VLD
I
DETERMINE THE OPTICAL PARAMETERS IN THE LASER BEAM PRODUCING SYSTEM UNDER DESIGN TO YIELD THE DESIRED FOCAL DISTANCE IN THE OUTPUT LASER BEAM DETERMINED AT BLOCK C
J

FIG. 3B3

ESTABLISH END-USER REQUIREMENTS FOR LASER BEAM PRODUCING MODULE UNDER DESIGN (e.g. WORKING DISTANCE, DEPTH OF FIELD, BAR CODE RESOLUTION, ETC.) — A

↓

DETERMINE THE NECESSARY SPOT-SIZE, ASPECT-RATIO, AND WAIST-DIMENSIONS OF THE OUTPUT LASER BEAM IN ORDER TO SCAN THE DESIRED CLASS OF BAR CODE SYMBOLS — B

↓

DETERMINE THE FOCAL DISTANCE OF THE LASER BEAM PRODUCING MODULE (i.e. SYSTEM) f_{MODULE} WHICH PROVIDES THE DESIRED DEPTH OF FIELD FOR THE END USER SCANNING SYSTEM AT THE DESIRED WORKING DISTANCE — C

↓

USING THE GAUSSIAN BEAM PROPOGATION MODEL, DETERMINE THE REQUIRED BEAM SIZE AND ASPECT RATIO LEAVING THE LASER BEAM PRODUCING SYSTEM UNDER DESIGN — D

↓

(A)

FIG. 3C1

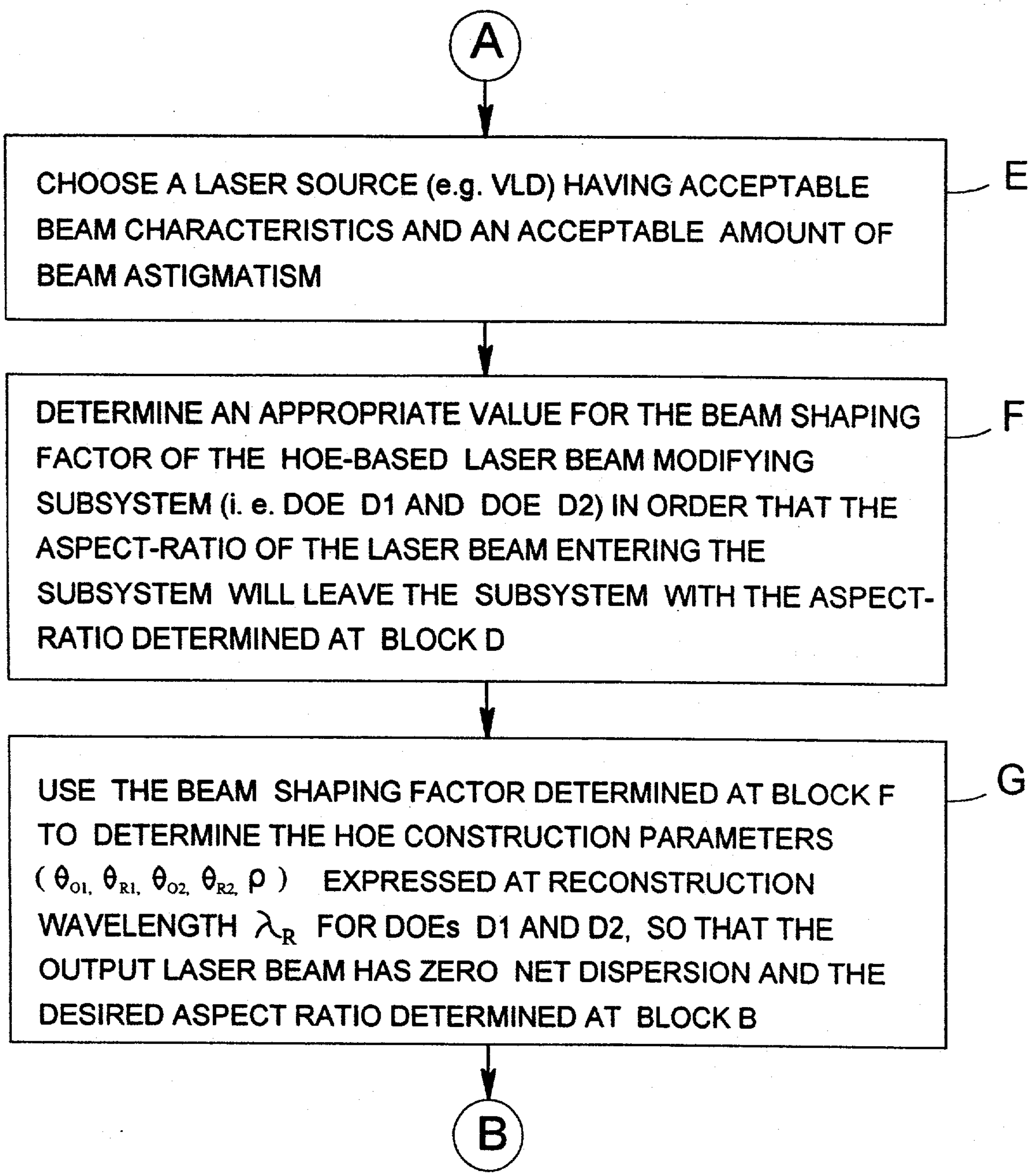

A
CHOOSE A LASER SOURCE (e.g. VLD) HAVING ACCEPTABLE BEAM CHARACTERISTICS AND AN ACCEPTABLE AMOUNT OF BEAM ASTIGMATISM
E
DETERMINE AN APPROPRIATE VALUE FOR THE BEAM SHAPING FACTOR OF THE HOE-BASED LASER BEAM MODIFYING SUBSYSTEM (i. e. DOE D1 AND DOE D2) IN ORDER THAT THE ASPECT-RATIO OF THE LASER BEAM ENTERING THE SUBSYSTEM WILL LEAVE THE SUBSYSTEM WITH THE ASPECT-RATIO DETERMINED AT BLOCK D
F
USE THE BEAM SHAPING FACTOR DETERMINED AT BLOCK F TO DETERMINE THE HOE CONSTRUCTION PARAMETERS ($\theta_{O1}, \theta_{R1}, \theta_{O2}, \theta_{R2}, \rho$) EXPRESSED AT RECONSTRUCTION WAVELENGTH λ_R FOR DOEs D1 AND D2, SO THAT THE OUTPUT LASER BEAM HAS ZERO NET DISPERSION AND THE DESIRED ASPECT RATIO DETERMINED AT BLOCK B
G
B

FIG. 3C2

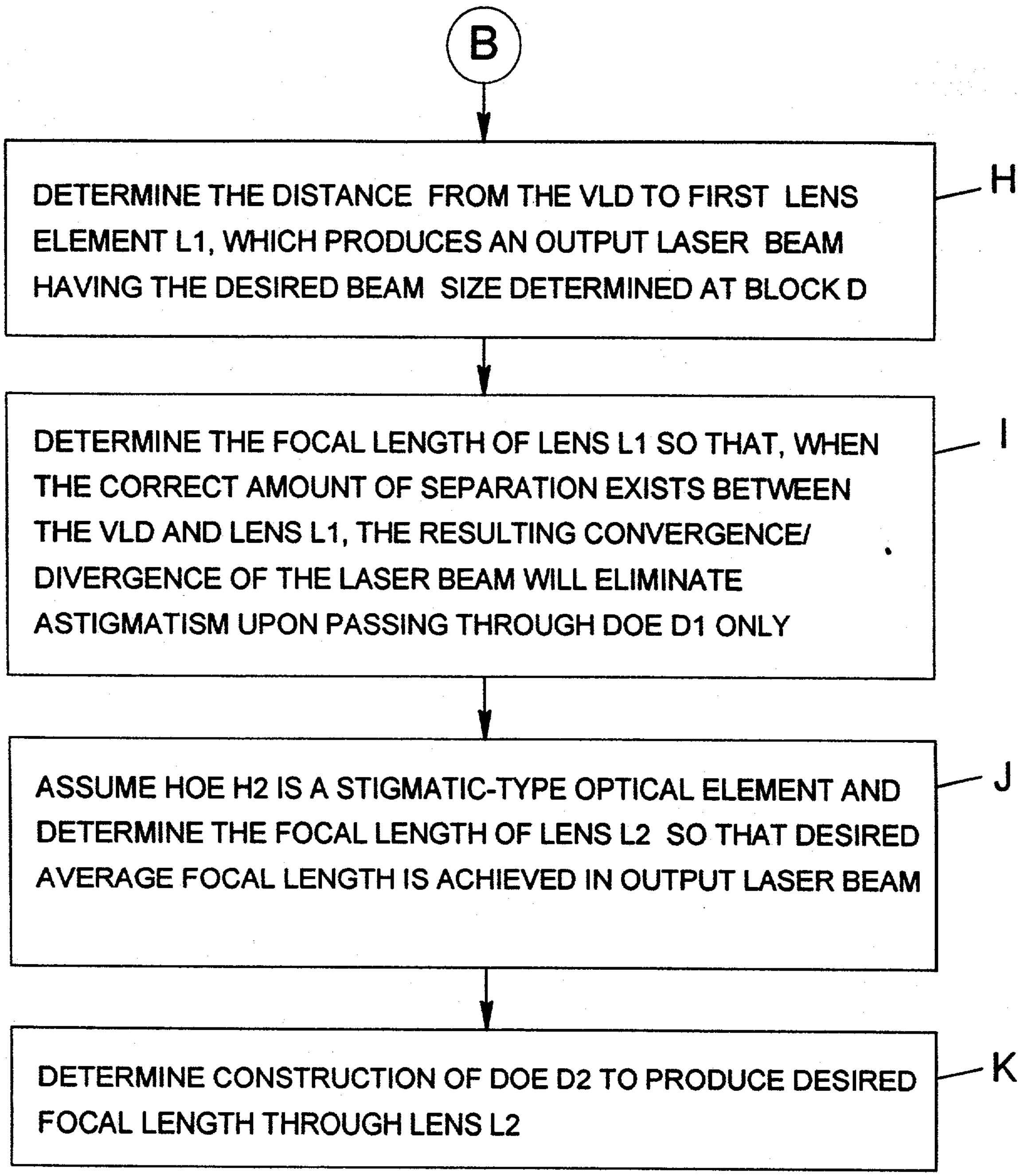

B
DETERMINE THE DISTANCE FROM THE VLD TO FIRST LENS ELEMENT L1, WHICH PRODUCES AN OUTPUT LASER BEAM HAVING THE DESIRED BEAM SIZE DETERMINED AT BLOCK D
H
DETERMINE THE FOCAL LENGTH OF LENS L1 SO THAT, WHEN THE CORRECT AMOUNT OF SEPARATION EXISTS BETWEEN THE VLD AND LENS L1, THE RESULTING CONVERGENCE/ DIVERGENCE OF THE LASER BEAM WILL ELIMINATE ASTIGMATISM UPON PASSING THROUGH DOE D1 ONLY
I
ASSUME HOE H2 IS A STIGMATIC-TYPE OPTICAL ELEMENT AND DETERMINE THE FOCAL LENGTH OF LENS L2 SO THAT DESIRED AVERAGE FOCAL LENGTH IS ACHIEVED IN OUTPUT LASER BEAM
J
DETERMINE CONSTRUCTION OF DOE D2 TO PRODUCE DESIRED FOCAL LENGTH THROUGH LENS L2
K

FIG. 3C3

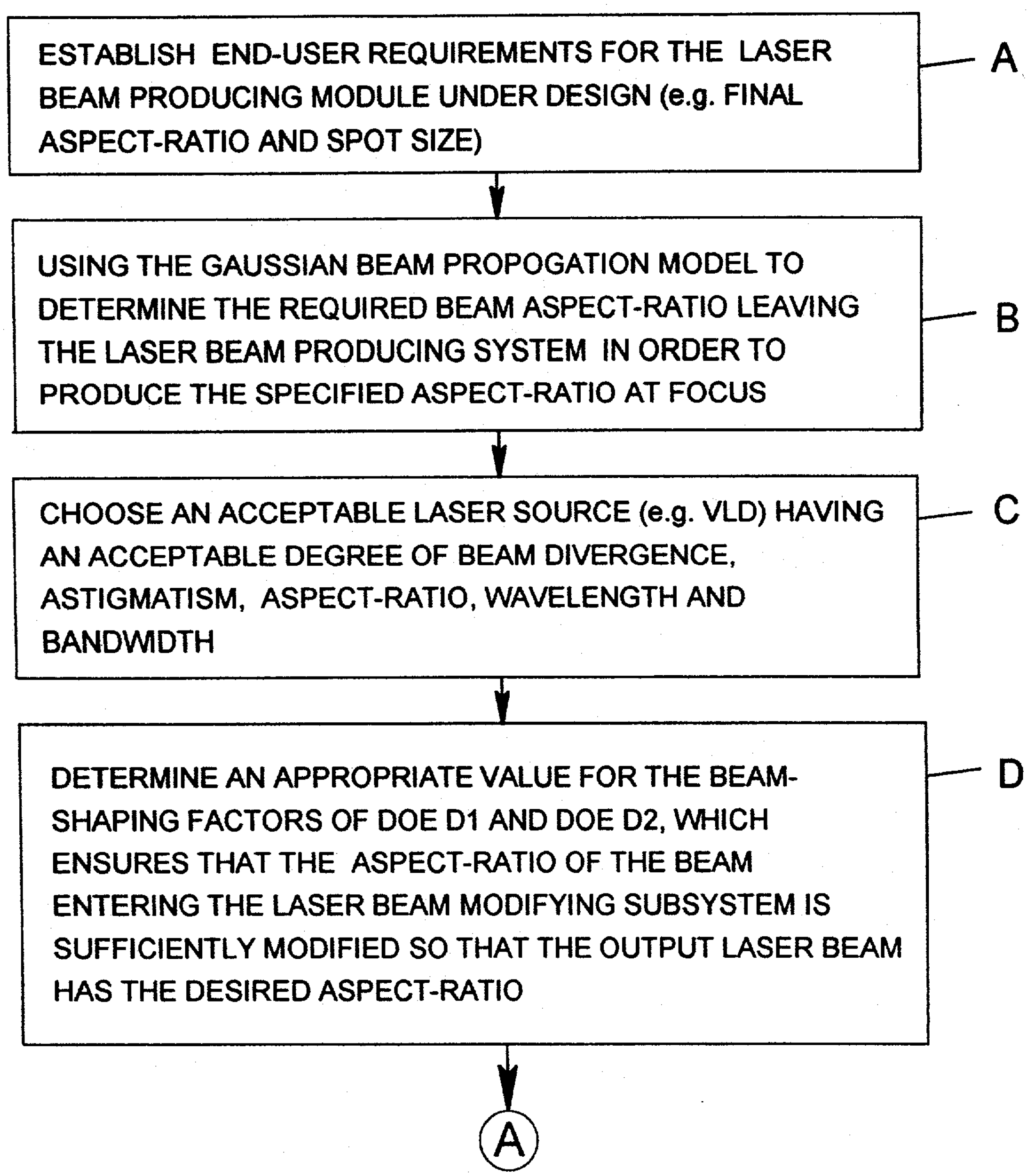

ESTABLISH END-USER REQUIREMENTS FOR THE LASER BEAM PRODUCING MODULE UNDER DESIGN (e.g. FINAL ASPECT-RATIO AND SPOT SIZE)
A
USING THE GAUSSIAN BEAM PROPOGATION MODEL TO DETERMINE THE REQUIRED BEAM ASPECT-RATIO LEAVING THE LASER BEAM PRODUCING SYSTEM IN ORDER TO PRODUCE THE SPECIFIED ASPECT-RATIO AT FOCUS
B
CHOOSE AN ACCEPTABLE LASER SOURCE (e.g. VLD) HAVING AN ACCEPTABLE DEGREE OF BEAM DIVERGENCE, ASTIGMATISM, ASPECT-RATIO, WAVELENGTH AND BANDWIDTH
C
DETERMINE AN APPROPRIATE VALUE FOR THE BEAM-SHAPING FACTORS OF DOE D1 AND DOE D2, WHICH ENSURES THAT THE ASPECT-RATIO OF THE BEAM ENTERING THE LASER BEAM MODIFYING SUBSYSTEM IS SUFFICIENTLY MODIFIED SO THAT THE OUTPUT LASER BEAM HAS THE DESIRED ASPECT-RATIO
D
A

FIG. 3D1

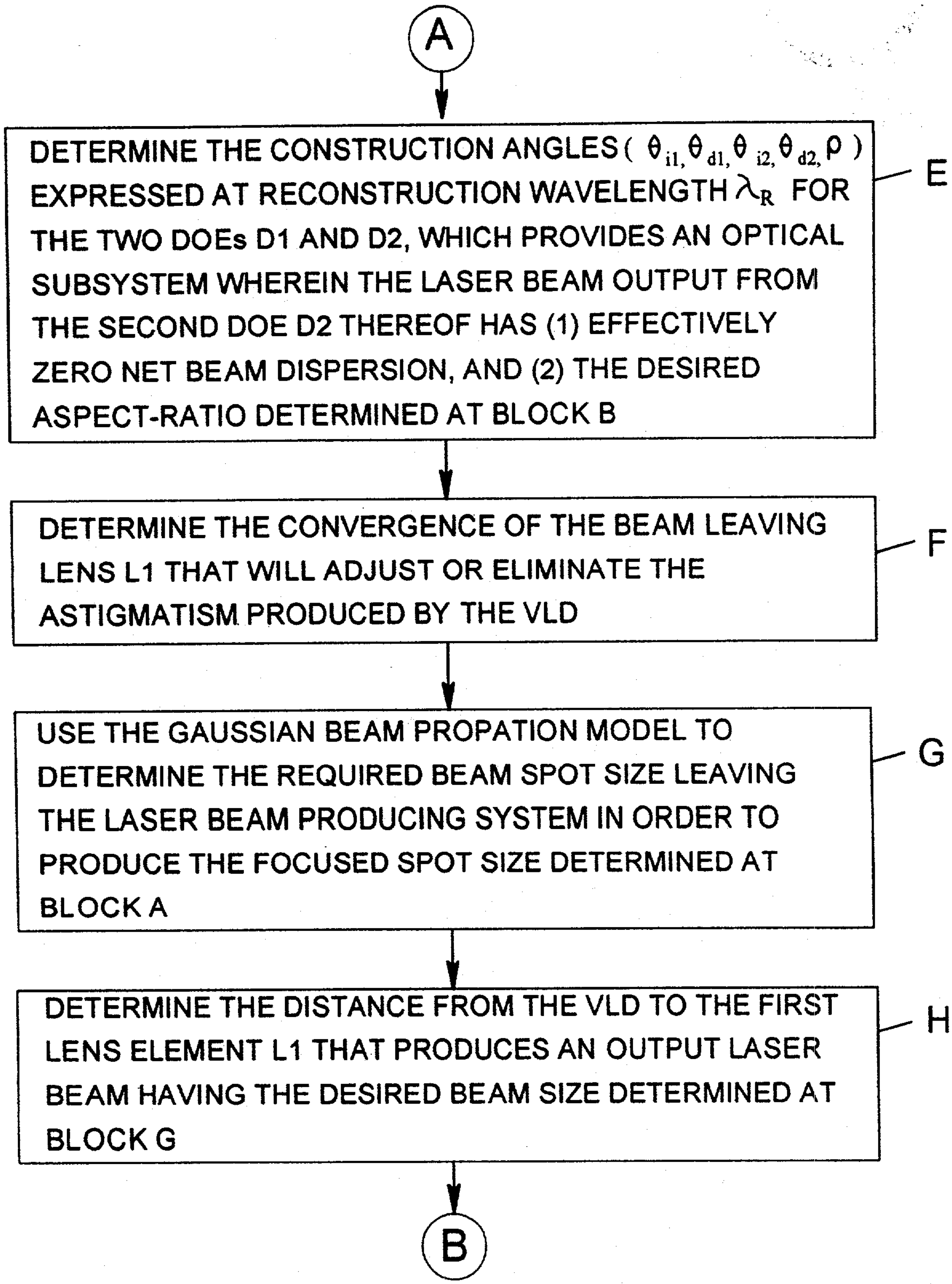

A
DETERMINE THE CONSTRUCTION ANGLES ($\theta_{i1}, \theta_{d1}, \theta_{i2}, \theta_{d2}, \rho$) EXPRESSED AT RECONSTRUCTION WAVELENGTH λ_R FOR THE TWO DOEs D1 AND D2, WHICH PROVIDES AN OPTICAL SUBSYSTEM WHEREIN THE LASER BEAM OUTPUT FROM THE SECOND DOE D2 THEREOF HAS (1) EFFECTIVELY ZERO NET BEAM DISPERSION, AND (2) THE DESIRED ASPECT-RATIO DETERMINED AT BLOCK B
E
DETERMINE THE CONVERGENCE OF THE BEAM LEAVING LENS L1 THAT WILL ADJUST OR ELIMINATE THE ASTIGMATISM PRODUCED BY THE VLD
F
USE THE GAUSSIAN BEAM PROPATION MODEL TO DETERMINE THE REQUIRED BEAM SPOT SIZE LEAVING THE LASER BEAM PRODUCING SYSTEM IN ORDER TO PRODUCE THE FOCUSED SPOT SIZE DETERMINED AT BLOCK A
G
DETERMINE THE DISTANCE FROM THE VLD TO THE FIRST LENS ELEMENT L1 THAT PRODUCES AN OUTPUT LASER BEAM HAVING THE DESIRED BEAM SIZE DETERMINED AT BLOCK G
H
B

FIG. 3D2

B

DETERMINE THE FOCAL LENGTH OF THE LENS ELEMENT L1 THAT PRODUCES A BEAM WITH THE CONVERGENCE DETERMINED IN BLOCK F

I

FIG. 3D3

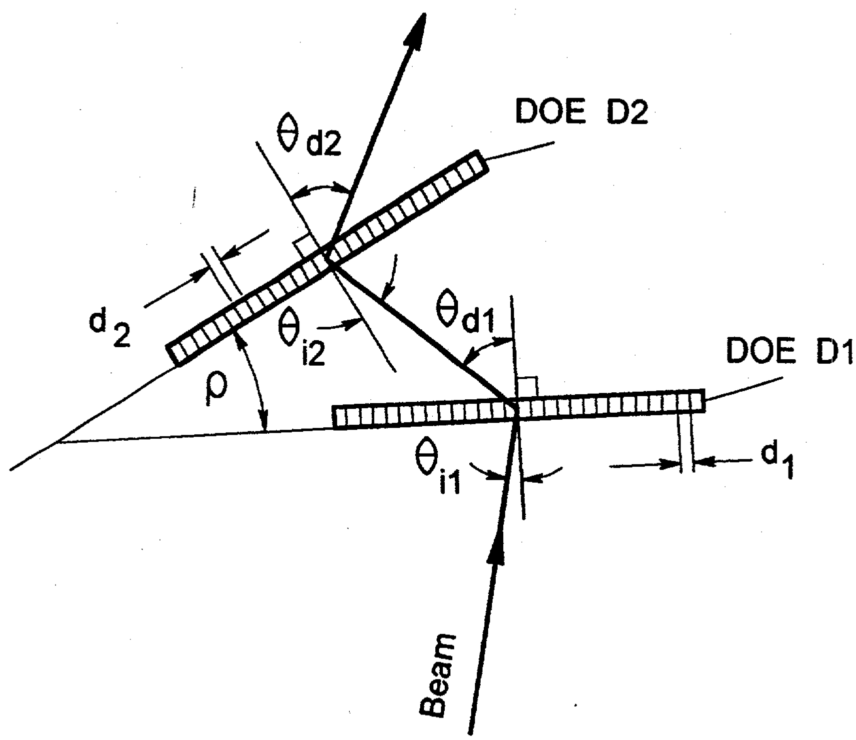


FIG. 3E

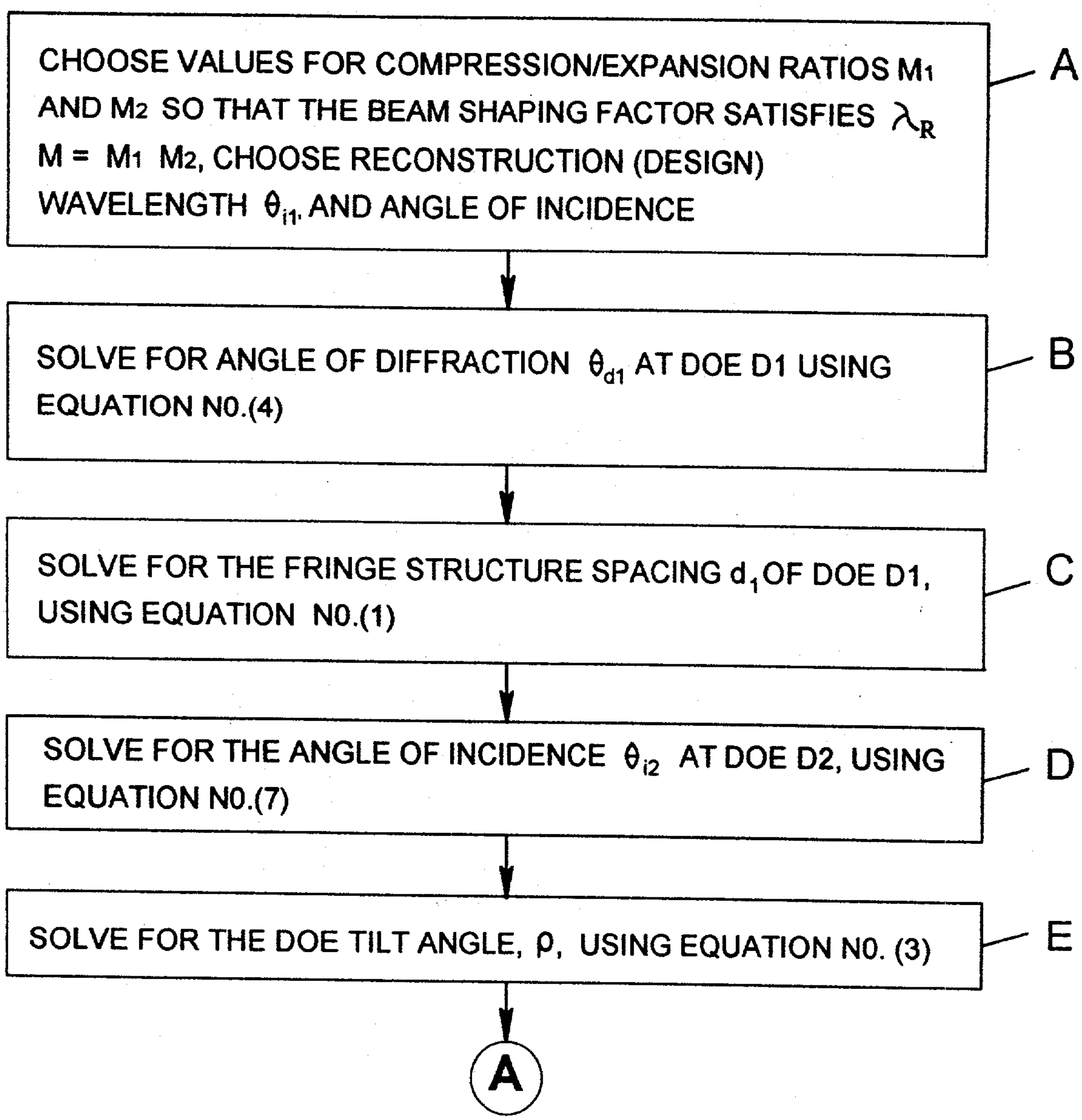

CHOOSE VALUES FOR COMPRESSION/EXPANSION RATIOS M_1 AND M_2 SO THAT THE BEAM SHAPING FACTOR SATISFIES λ_R $M = M_1 M_2$, CHOOSE RECONSTRUCTION (DESIGN) WAVELENGTH θ_{i1}, AND ANGLE OF INCIDENCE
A
SOLVE FOR ANGLE OF DIFFRACTION θ_{d1} AT DOE D1 USING EQUATION N0.(4)
B
SOLVE FOR THE FRINGE STRUCTURE SPACING d_1 OF DOE D1, USING EQUATION N0.(1)
C
SOLVE FOR THE ANGLE OF INCIDENCE θ_{i2} AT DOE D2, USING EQUATION N0.(7)
D
SOLVE FOR THE DOE TILT ANGLE, ρ, USING EQUATION N0. (3)
E
A

FIG. 3F1

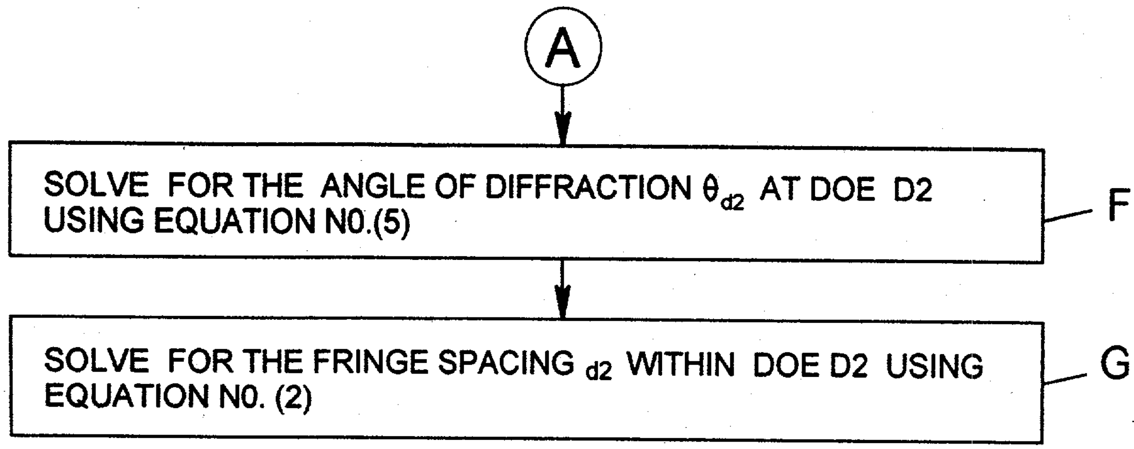

A
SOLVE FOR THE ANGLE OF DIFFRACTION θ_{d2} AT DOE D2 USING EQUATION N0.(5)
F
SOLVE FOR THE FRINGE SPACING $_{d2}$ WITHIN DOE D2 USING EQUATION N0. (2)
G

FIG. 3F2

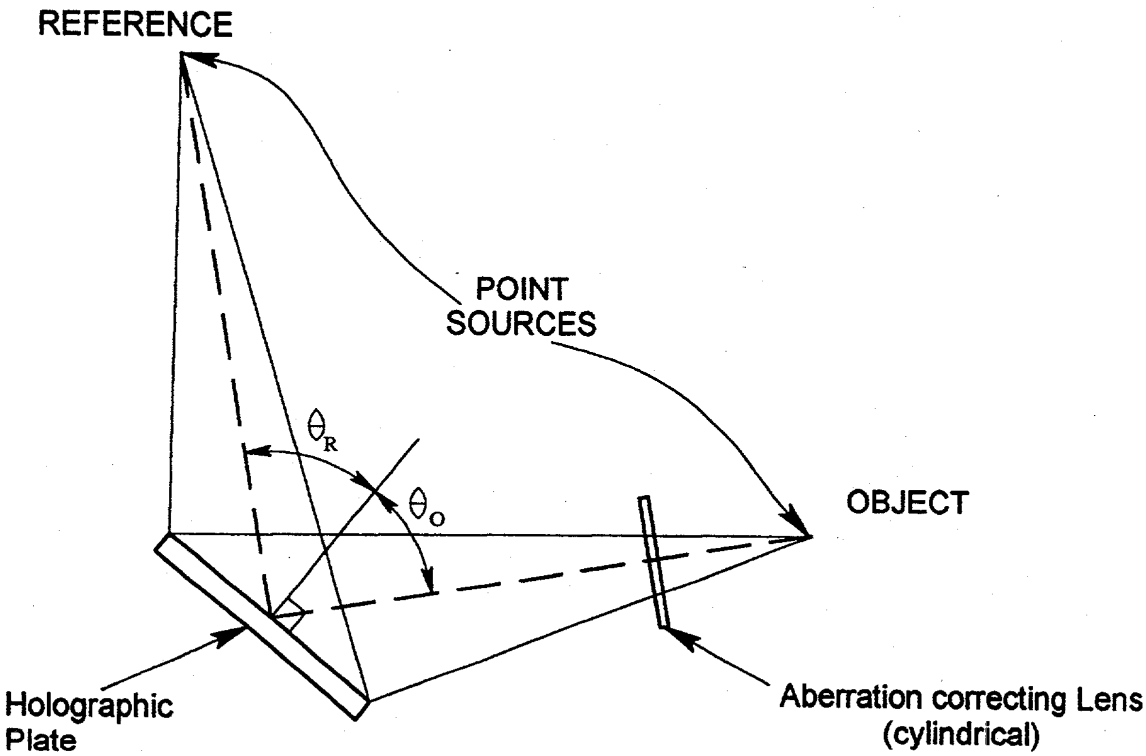
CONVERT THE DESIGN PARAMETERS θ_{i1}, θ_{d1}, θ_{i2}, θ_{d2}, (AND f_2) EXPRESSED AT THE RECONSTRUCTION WAVELENGTH λ_R, INTO CONSTRUCTION PARAMETERS EXPRESSED AT THE CONSTRUCTION WAVELENGTH λ_c, NAMELY: θ_{O1}, θ_{R1}, FOR HOE H1; AND θ_{O2}, θ_{R2}, FOR HOE H2

A

IN THE CASE OF VARIABLE SPATIAL FREQUENCY DOEs, USE COMPUTER-RAY TRACING TO DETERMINE THE DISTANCES OF THE OBJECT AND REFERENCE (BEAM) SOURCES RELATIVE TO THE HOLOGRAPHIC RECORDING MEDIUM (AS WELL AS THE DISTANCES OF ANY ABERRATION-CORRECTING LENSES THEREFROM) EMPLOYED DURING THE HOLOGRAPHIC RECORDING PROCESS

B

FIG. 4A



θ_R = REFERENCE BEAM ANGLE OF INCIDENCE

θ_O = OBJECT BEAM ANGLE OF INCIDENCE

FIG. 4B

FORMULATE WITHIN A DIGITAL COMPUTER SYSTEM, A MATHEMATICAL DESCRIPTION OF THE OBJECT AND REFERENCE BEAM WAVEFRONTS USED TO CONSTRUCT DOE D1 AND DOE D2, DURING OPTICAL FORMATION THEREOF WHEN USING THE HOLOGRAPHIC RECORDING METHOD SHOWN IN FIG. 4B

A

USE THE DIGITAL COMPUTER SYSTEM TO FORMULATE A MATHEMATICAL DESCRIPTION OF THE INTERFERENCE PATTERN THAT IS GENERATED BY MATHEMATICALLY ADDING THE MATHEMATICAL MODEL OF THE OBJECT BEAM WAVEFRONT TO THE REFERENCE BEAM WAVEFRONT, TO PROVIDE A SPATIAL FUNCTION OF THE COMPUTER GENERATED / REPRESENTED INTERFERENCE PATTERN

B

USE THE DIGITAL COMPUTER SYSTEM TO SAMPLE THE SPATIAL FUNCTION OF THE COMPUTER GENERATED/ REPRESENTED INTERFERENCE PATTERN ALONG THE X AND Y DIRECTIONS THEREOF TO PRODUCE A LARGE SET OF SAMPLED VALUES OF VARYING AMPLITUDE TRANSMITTANCE ASSOCIATED WITH THE COMPUTER GENERATED INTERFERENCE PATTERN

C

A

FIG. 4C1

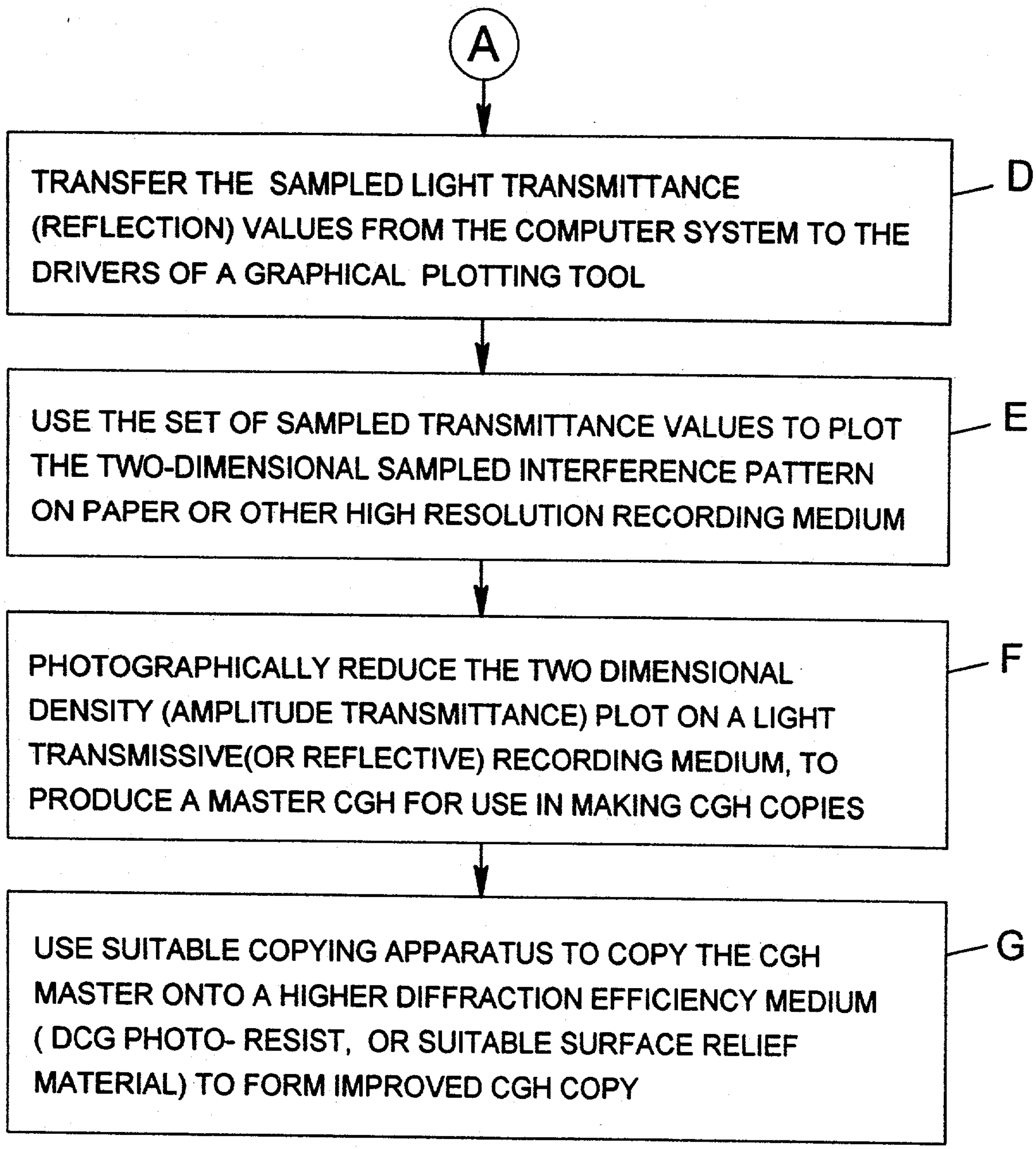

A
TRANSFER THE SAMPLED LIGHT TRANSMITTANCE (REFLECTION) VALUES FROM THE COMPUTER SYSTEM TO THE DRIVERS OF A GRAPHICAL PLOTTING TOOL
D
USE THE SET OF SAMPLED TRANSMITTANCE VALUES TO PLOT THE TWO-DIMENSIONAL SAMPLED INTERFERENCE PATTERN ON PAPER OR OTHER HIGH RESOLUTION RECORDING MEDIUM
E
PHOTOGRAPHICALLY REDUCE THE TWO DIMENSIONAL DENSITY (AMPLITUDE TRANSMITTANCE) PLOT ON A LIGHT TRANSMISSIVE(OR REFLECTIVE) RECORDING MEDIUM, TO PRODUCE A MASTER CGH FOR USE IN MAKING CGH COPIES
F
USE SUITABLE COPYING APPARATUS TO COPY THE CGH MASTER ONTO A HIGHER DIFFRACTION EFFICIENCY MEDIUM (DCG PHOTO- RESIST, OR SUITABLE SURFACE RELIEF MATERIAL) TO FORM IMPROVED CGH COPY
G

FIG. 4C2

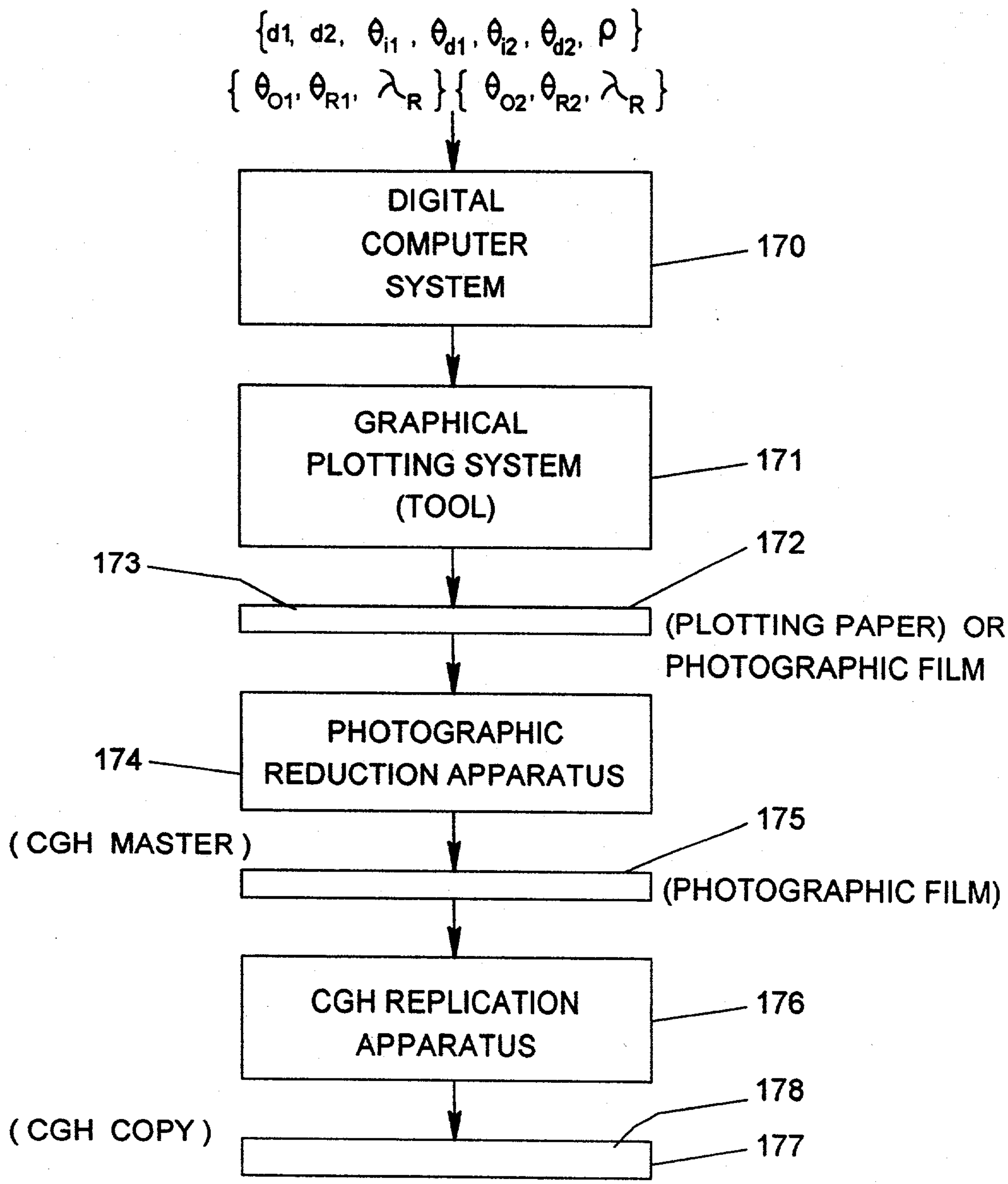
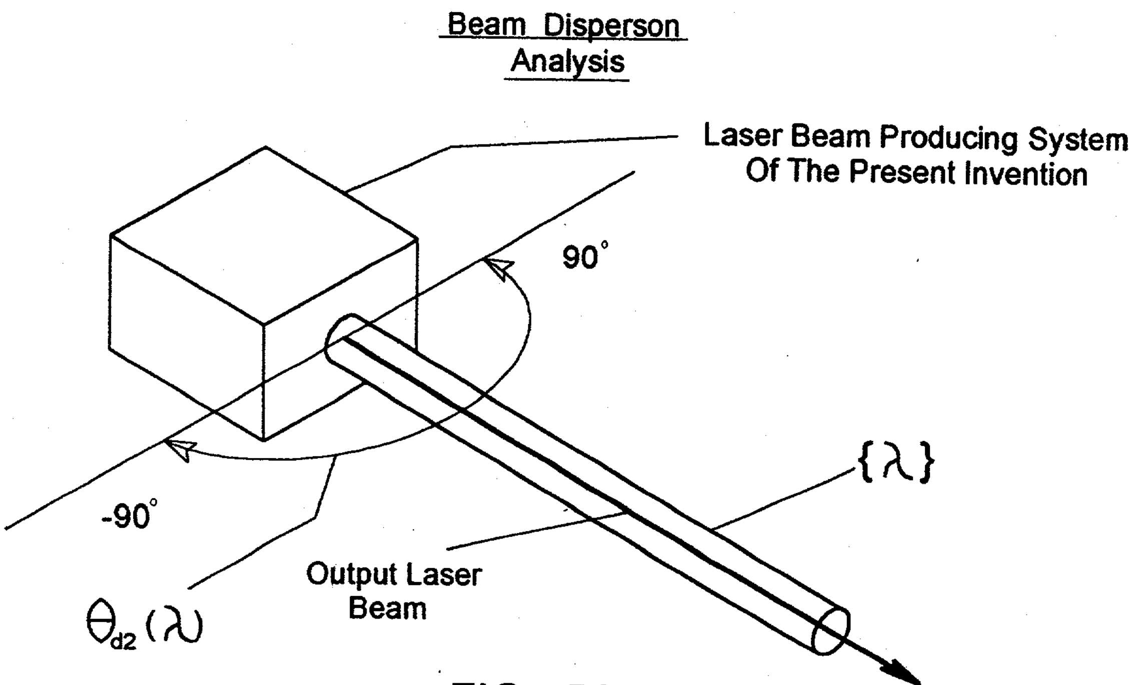
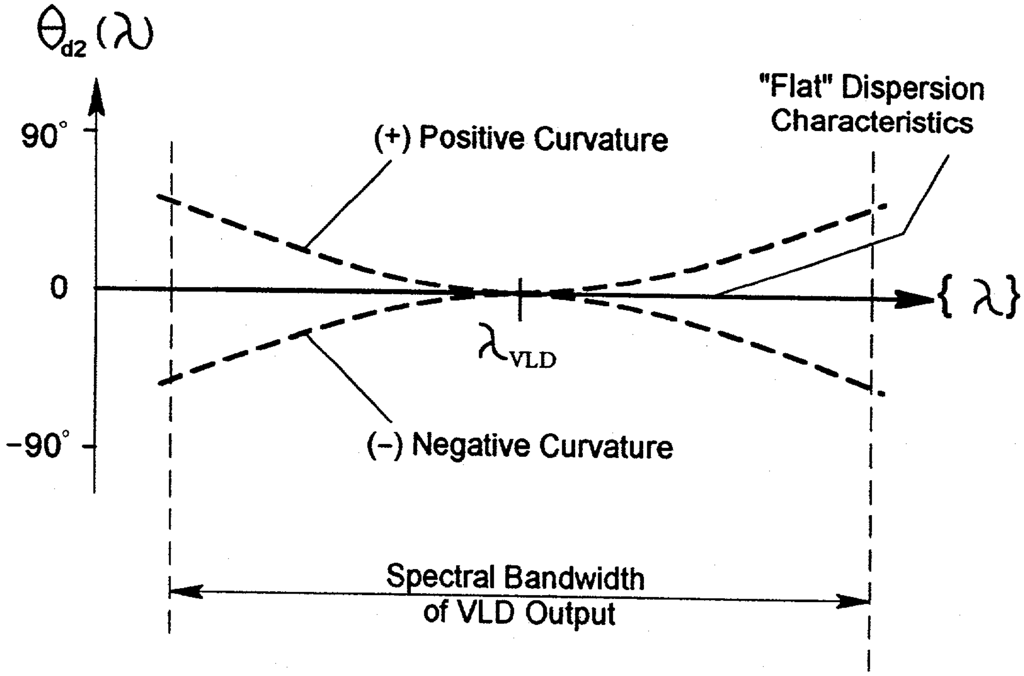

{d1, d2, θi1 , θd1 , θi2 , θd2, ρ }
{ θO1, θR1, λR } { θO2, θR2, λR }
DIGITAL COMPUTER SYSTEM
170
GRAPHICAL PLOTTING SYSTEM (TOOL)
171
172
173
(PLOTTING PAPER) OR PHOTOGRAPHIC FILM
PHOTOGRAPHIC REDUCTION APPARATUS
174
175
(CGH MASTER)
(PHOTOGRAPHIC FILM)
CGH REPLICATION APPARATUS
176
178
(CGH COPY)
177

FIG. 4D



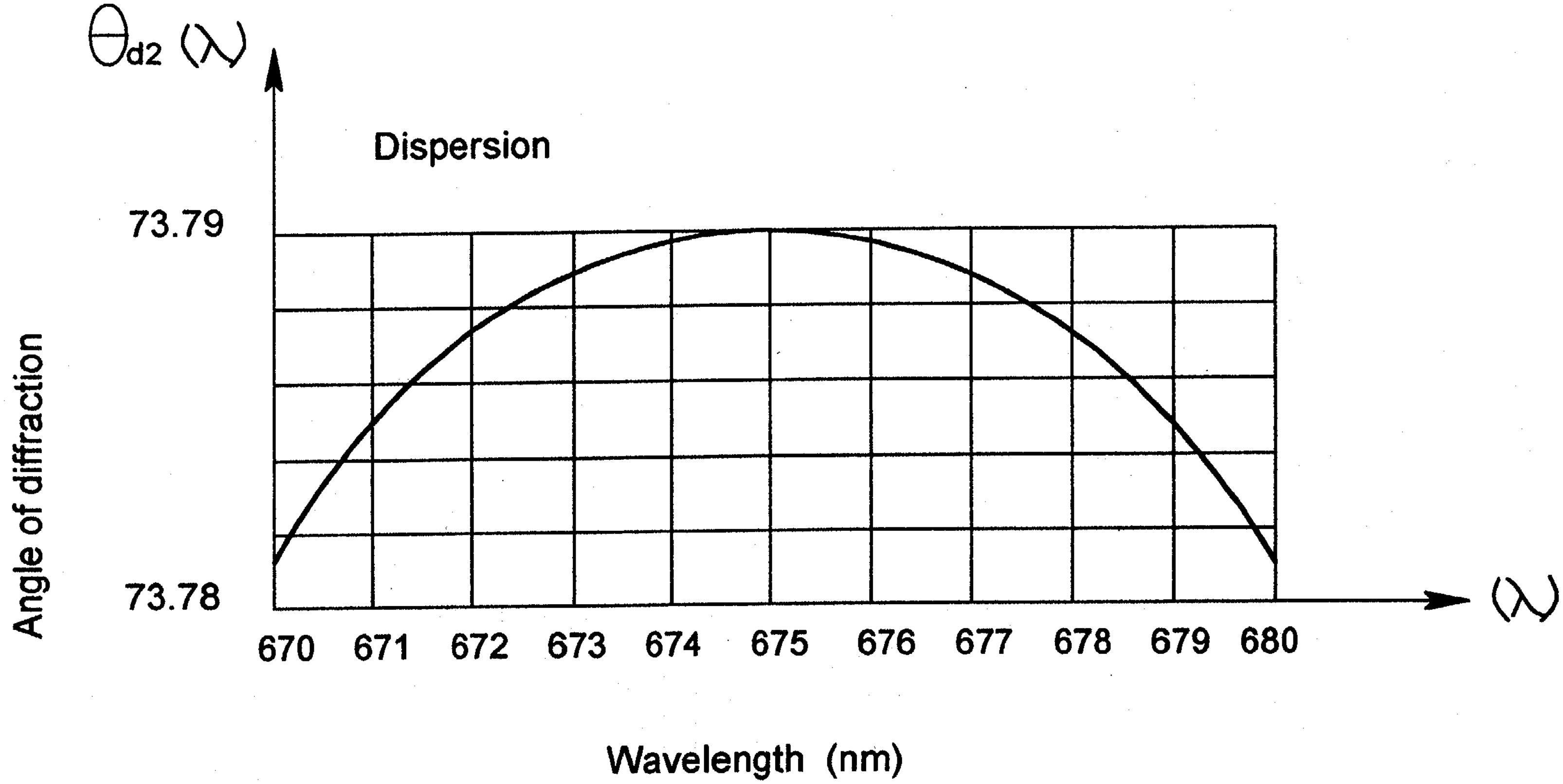
Beam Disperson
Analysis
Laser Beam Producing System
Of The Present Invention
90°
-90°
{λ}
Output Laser
Beam
$\Theta_{d2}(\lambda)$

FIG. 5A



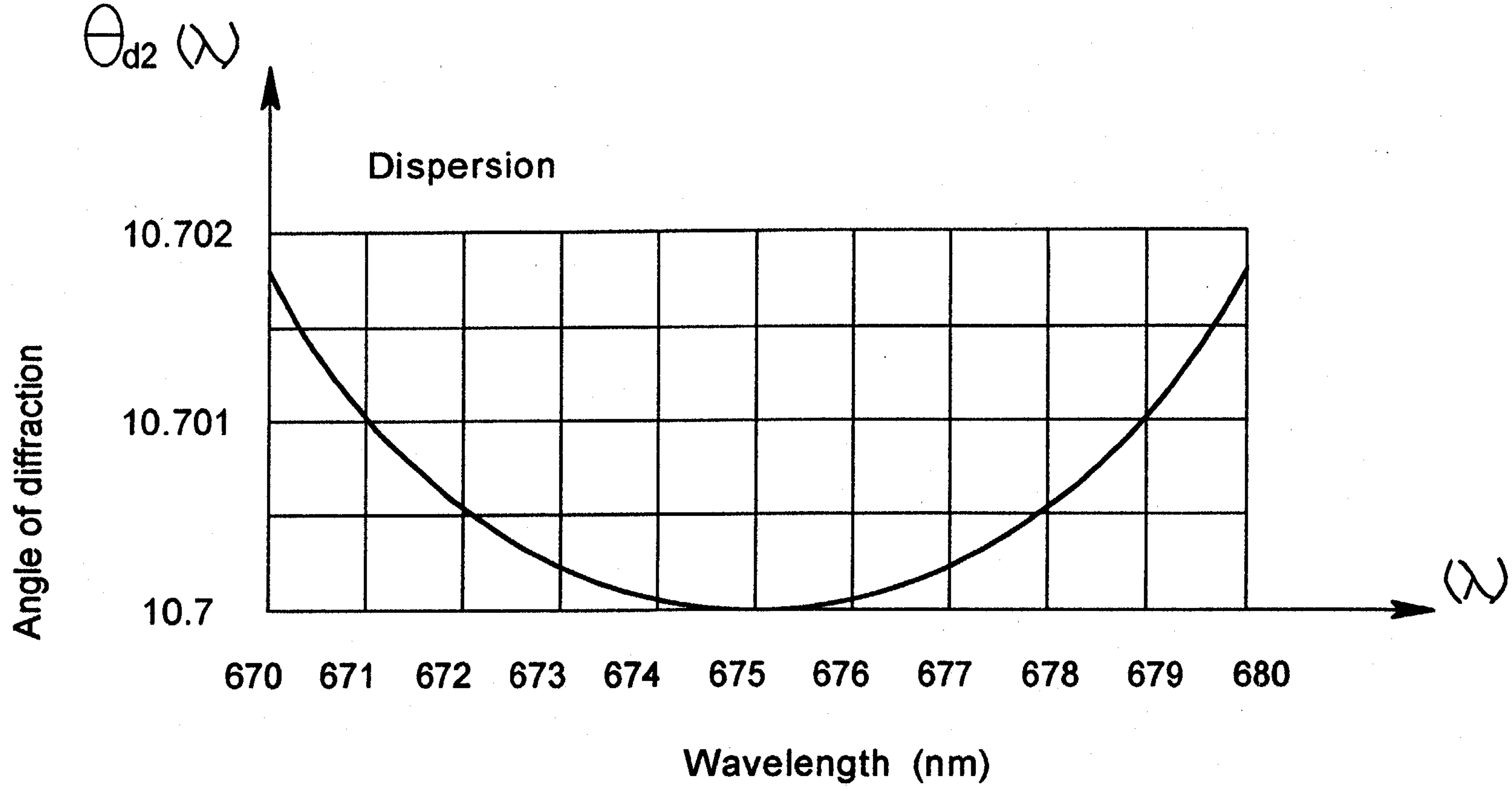
$\Theta_{d2}(\lambda)$
90°
0
-90°
(+) Positive Curvature
"Flat" Dispersion
Characteristics
{ λ}
λ_{VLD}
(–) Negative Curvature
Spectral Bandwidth
of VLD Output

FIG. 5B



$\Theta_{d2}(\lambda)$
Dispersion
73.79
73.78
Angle of diffraction
670
671
672
673
674
675
676
677
678
679
680
(λ)
Wavelength (nm)

FIG. 5B1



$\theta_{d2}(\lambda)$
Dispersion
Angle of diffraction
10.702
10.701
10.7
670
671
672
673
674
675
676
677
678
679
680
(λ)
Wavelength (nm)

FIG. 5B2

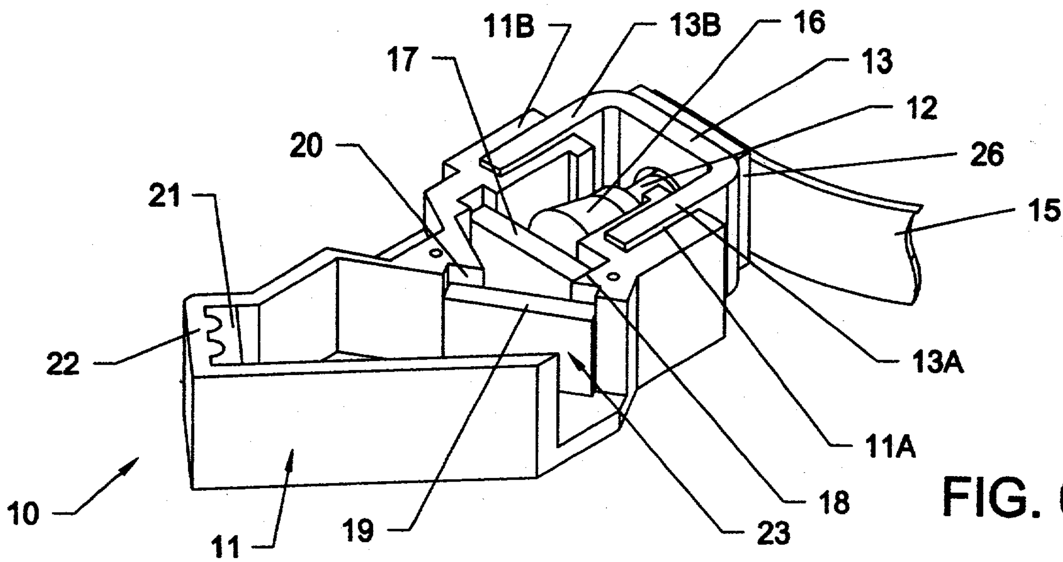


FIG. 6A

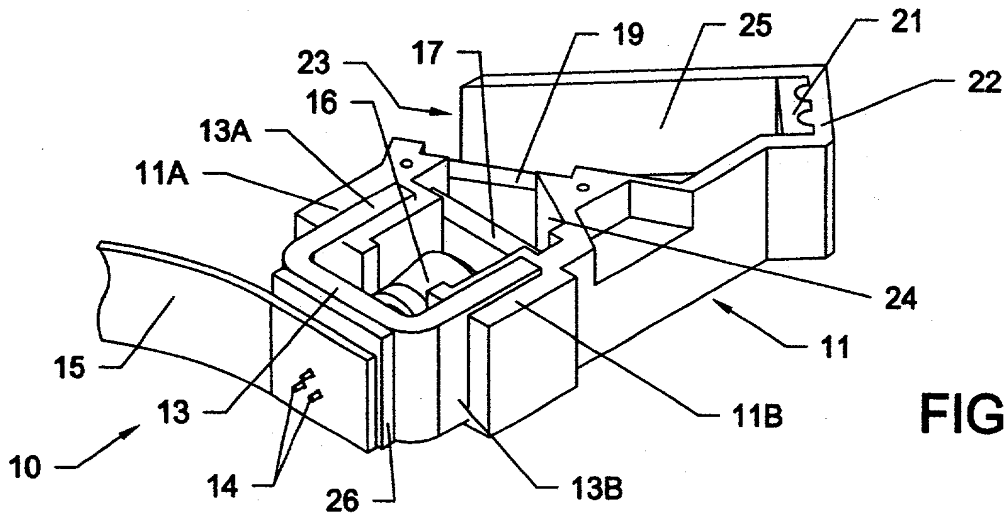


FIG. 6B

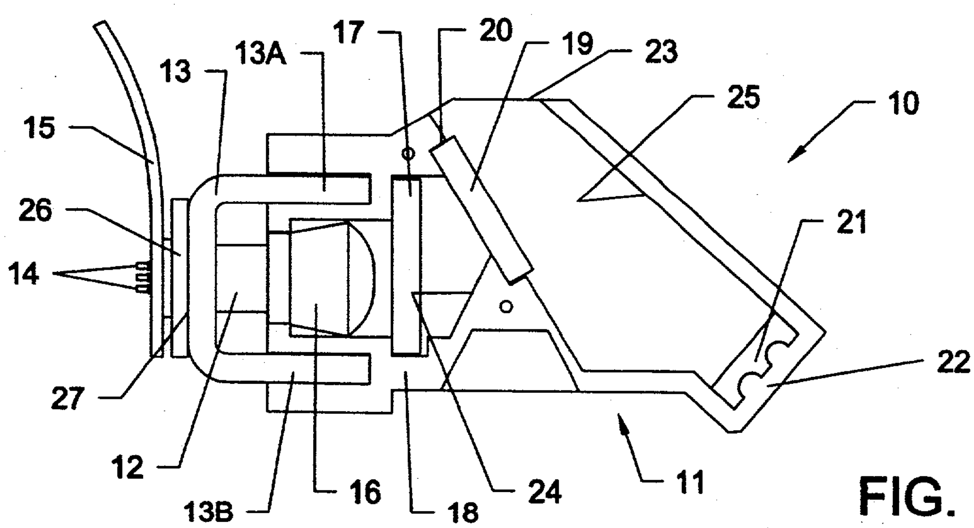


FIG. 6C

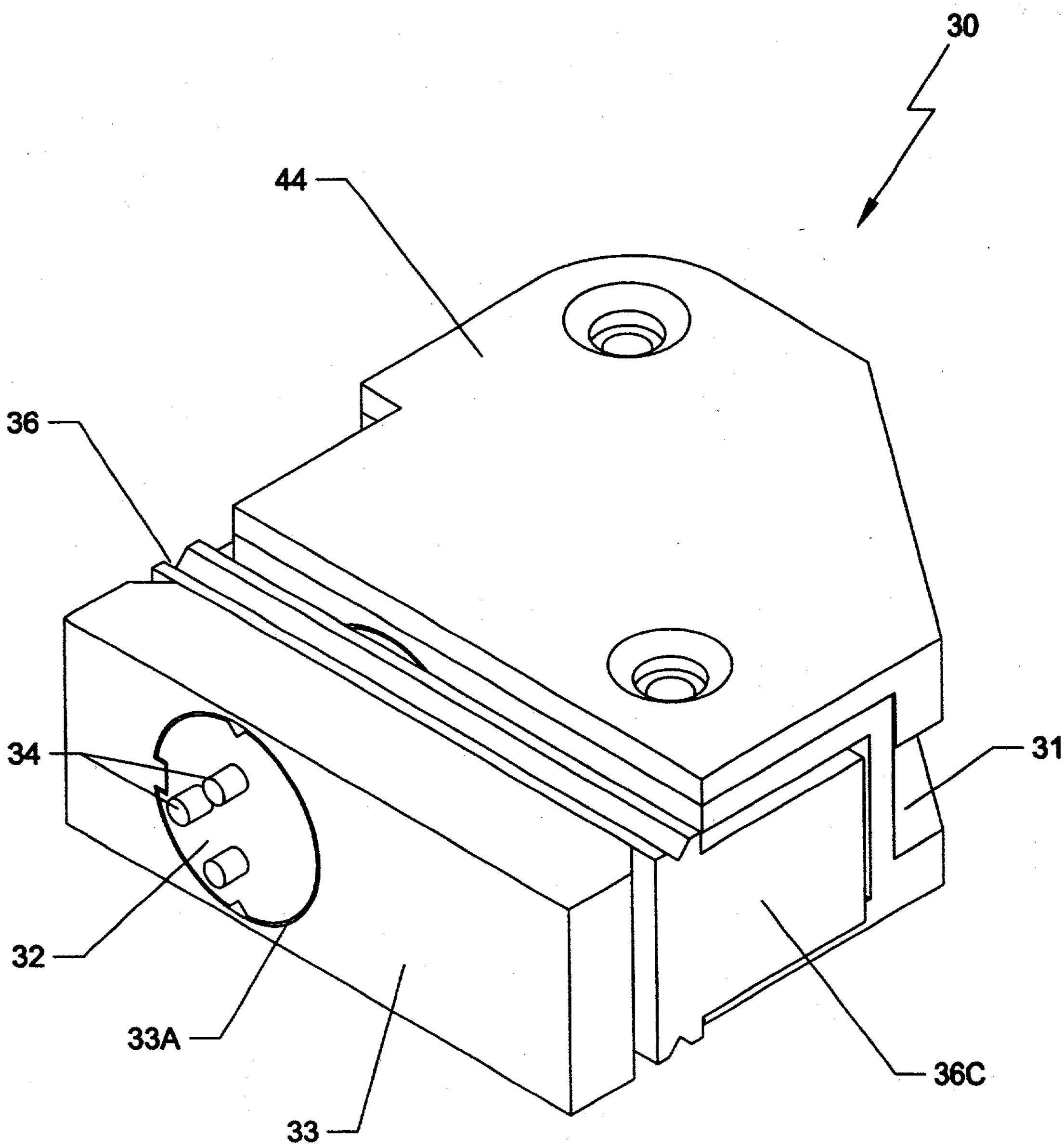


FIG. 7A

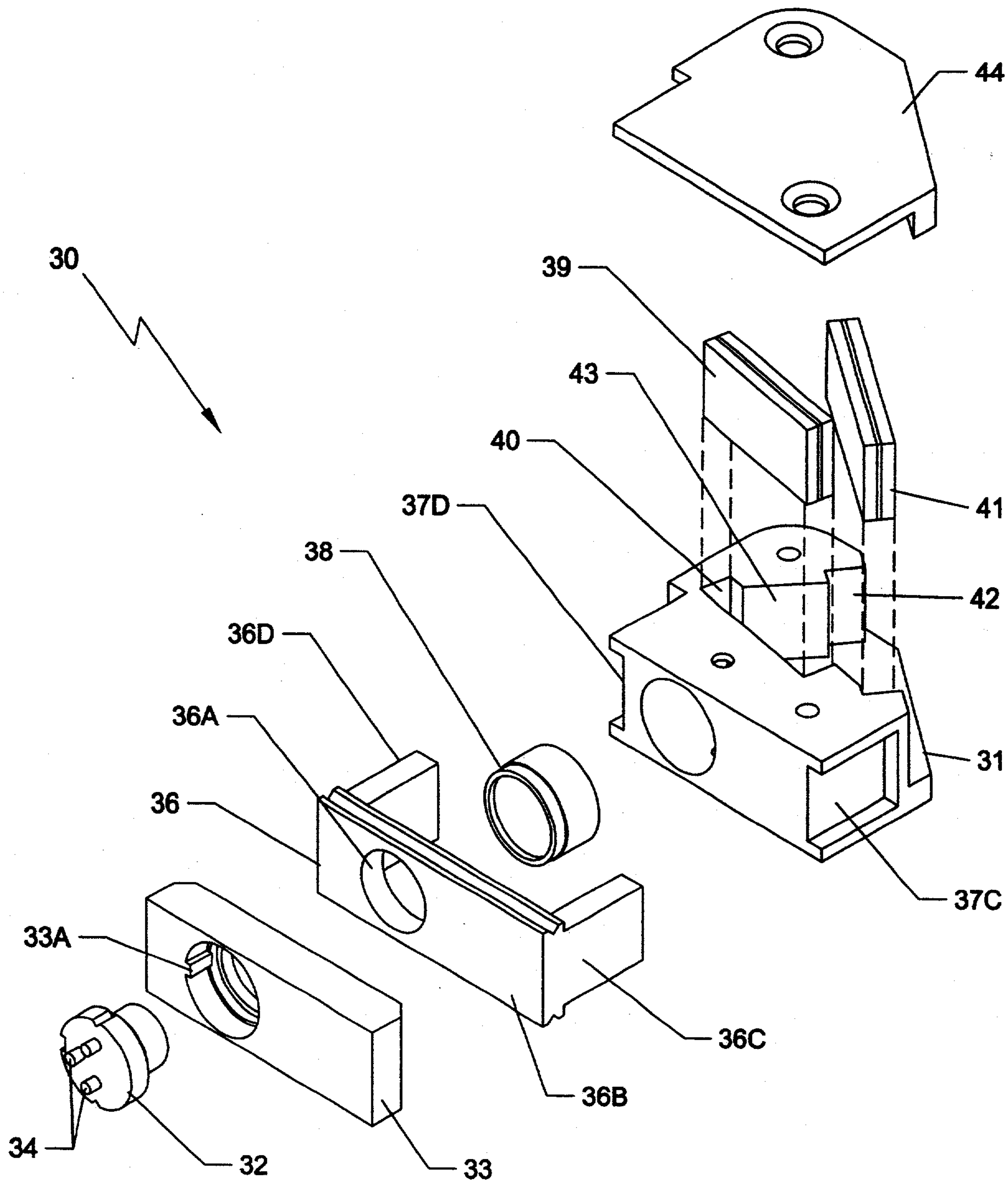


FIG. 7B

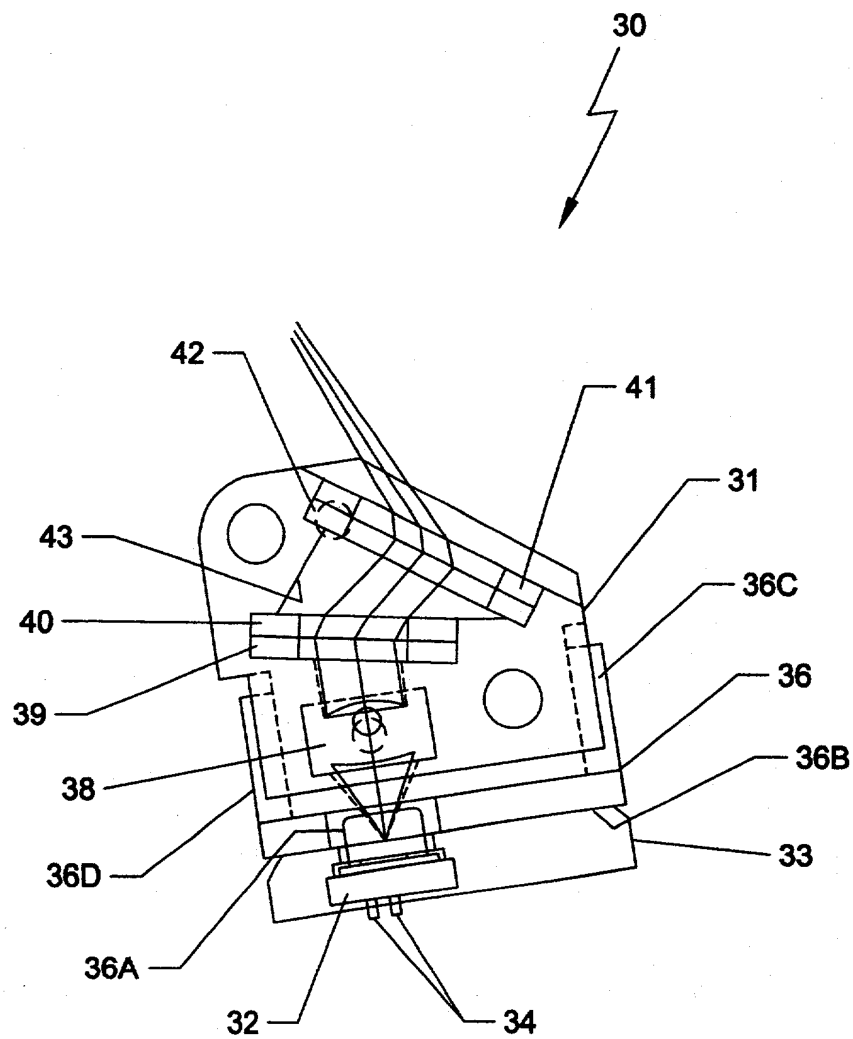


FIG. 7C

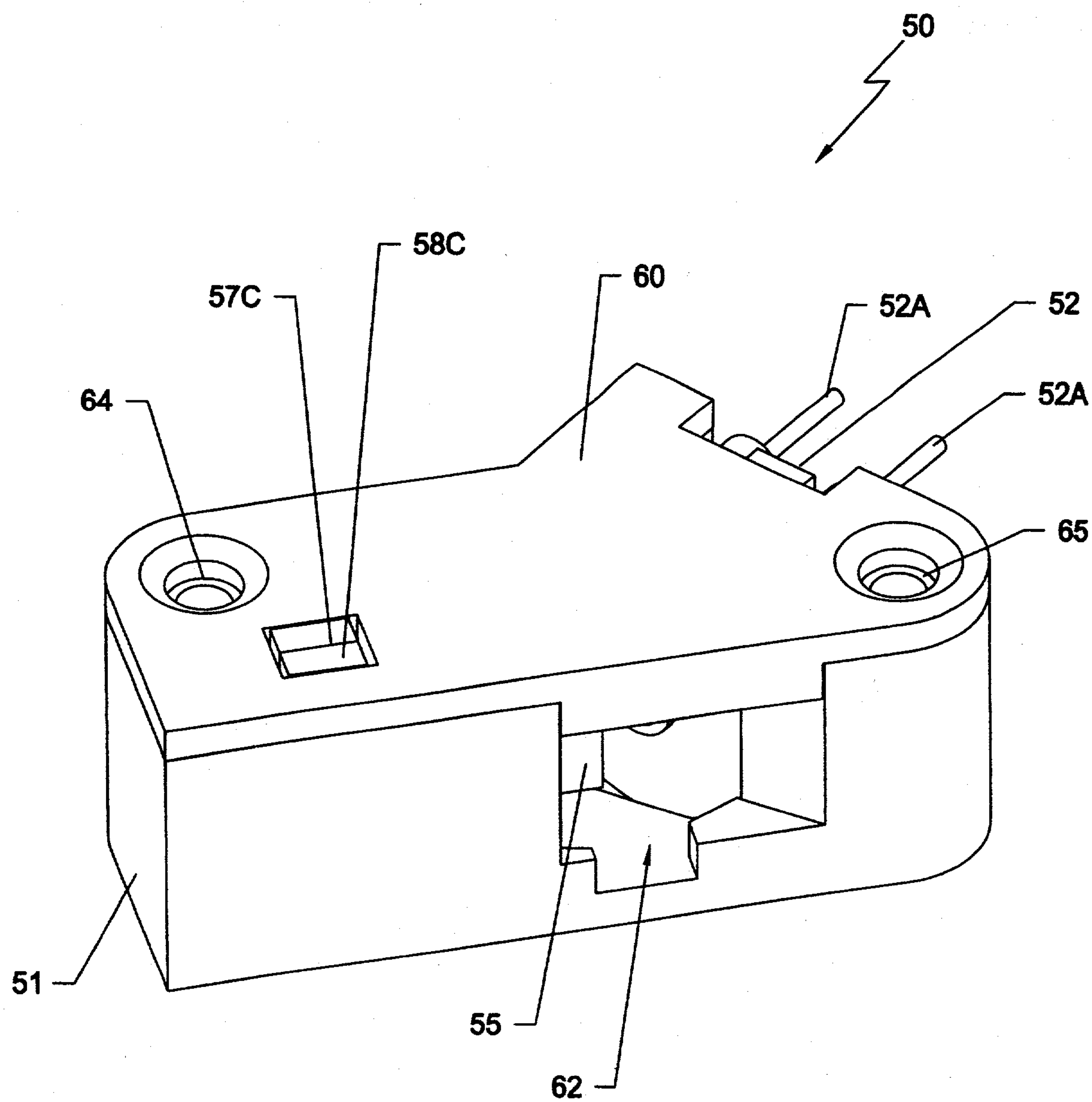


FIG. 8A

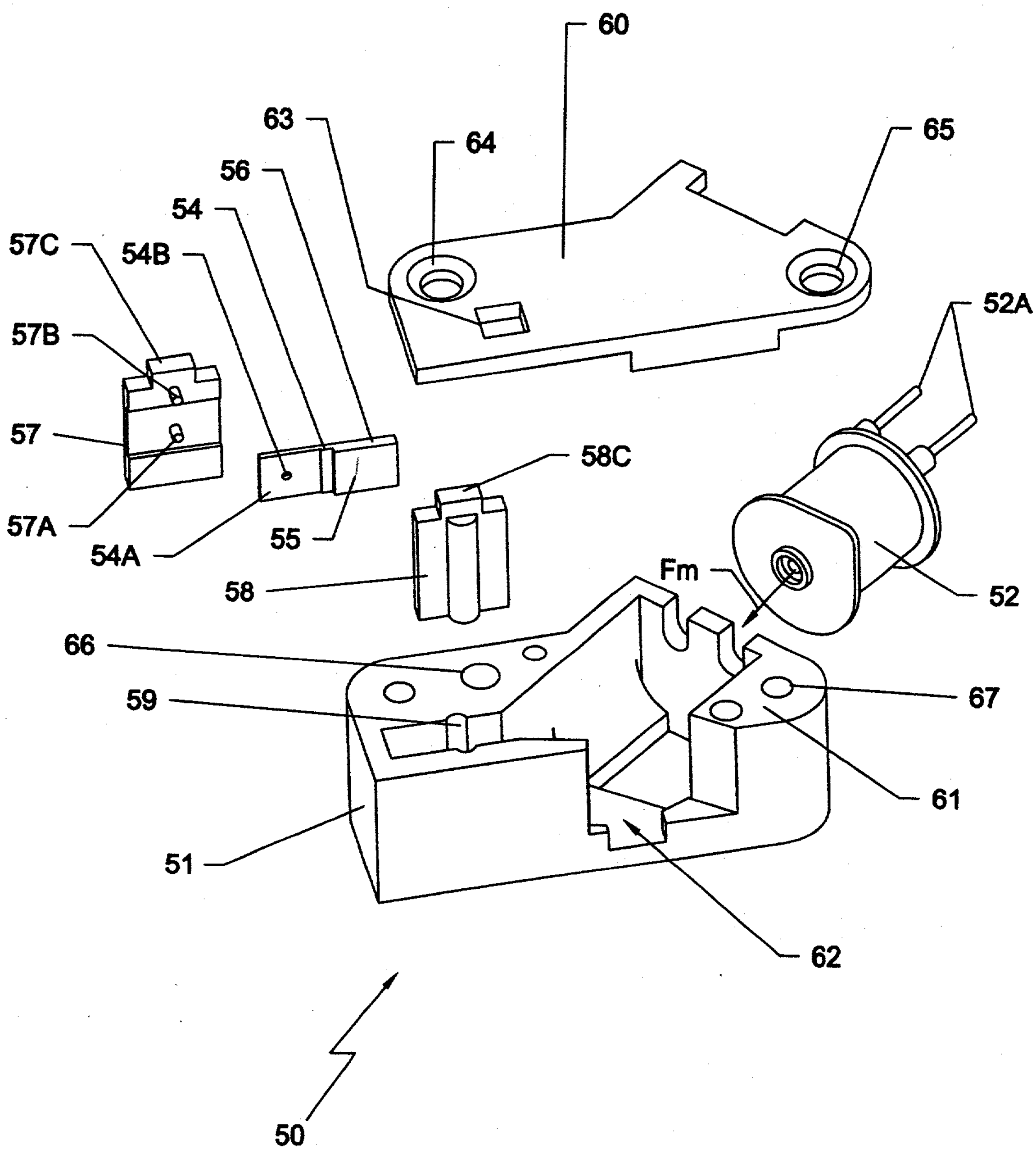

60
63
64
65
56
54
57C
54B
52A
57B
57
58C
57A
54A
55
58
Fm
52
66
59
67
61
51
62
50

FIG. 8B

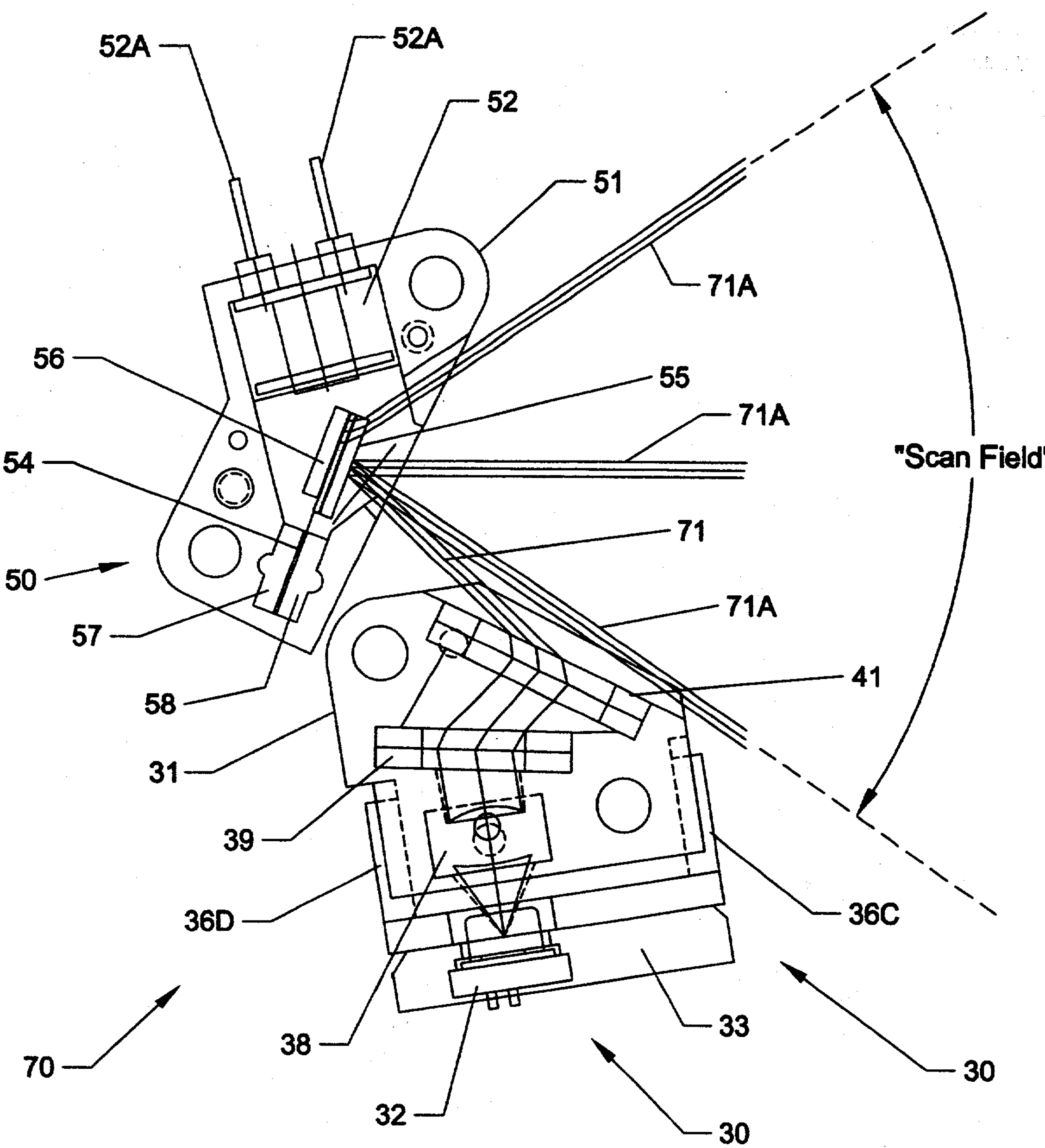

52A
52A
52
51
71A
56
55
71A
"Scan Field"
54
71
50
71A
57
41
58
31
39
36D
36C
38
33
70
30
32
30

FIG. 9

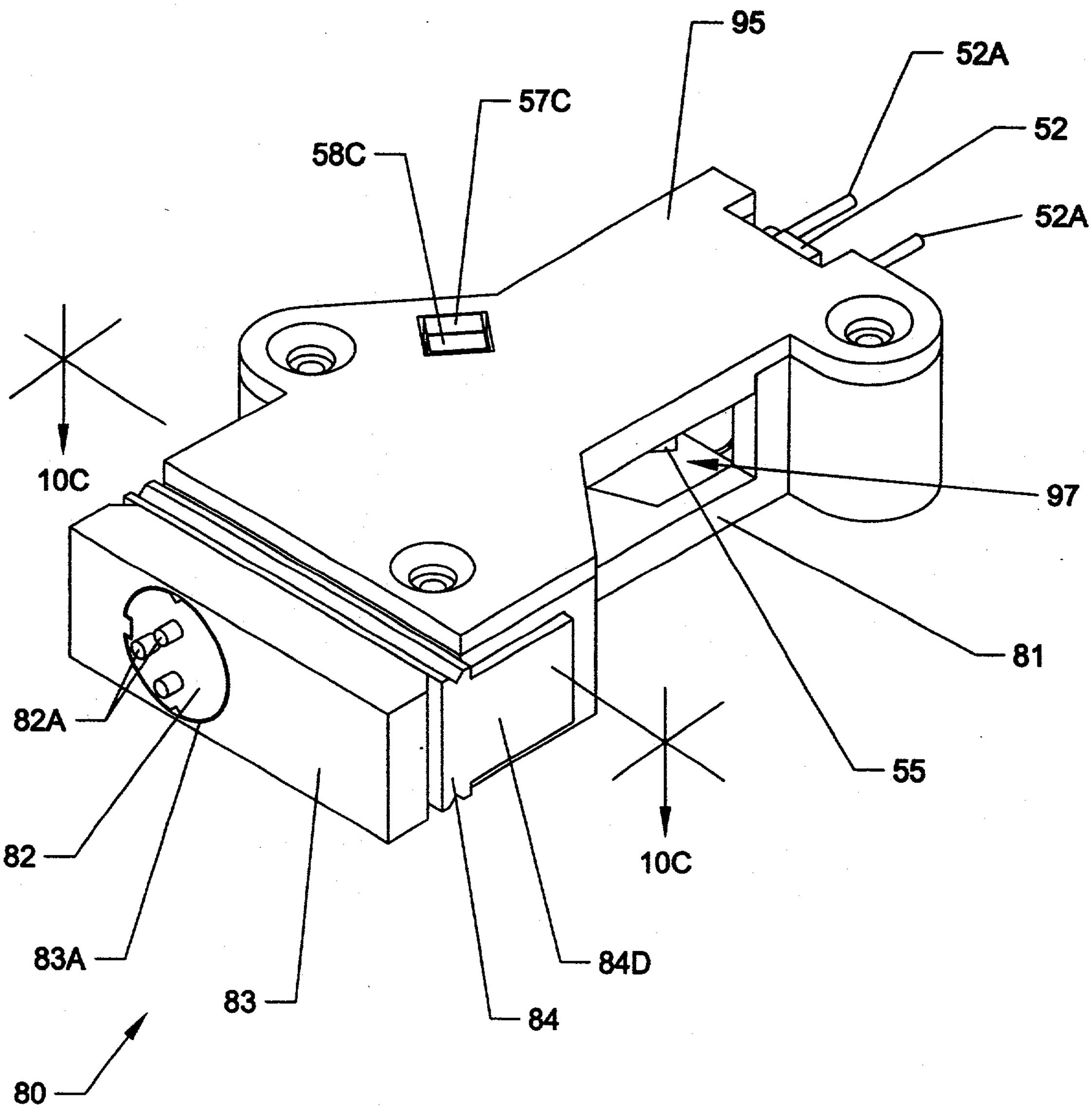


FIG. 10A

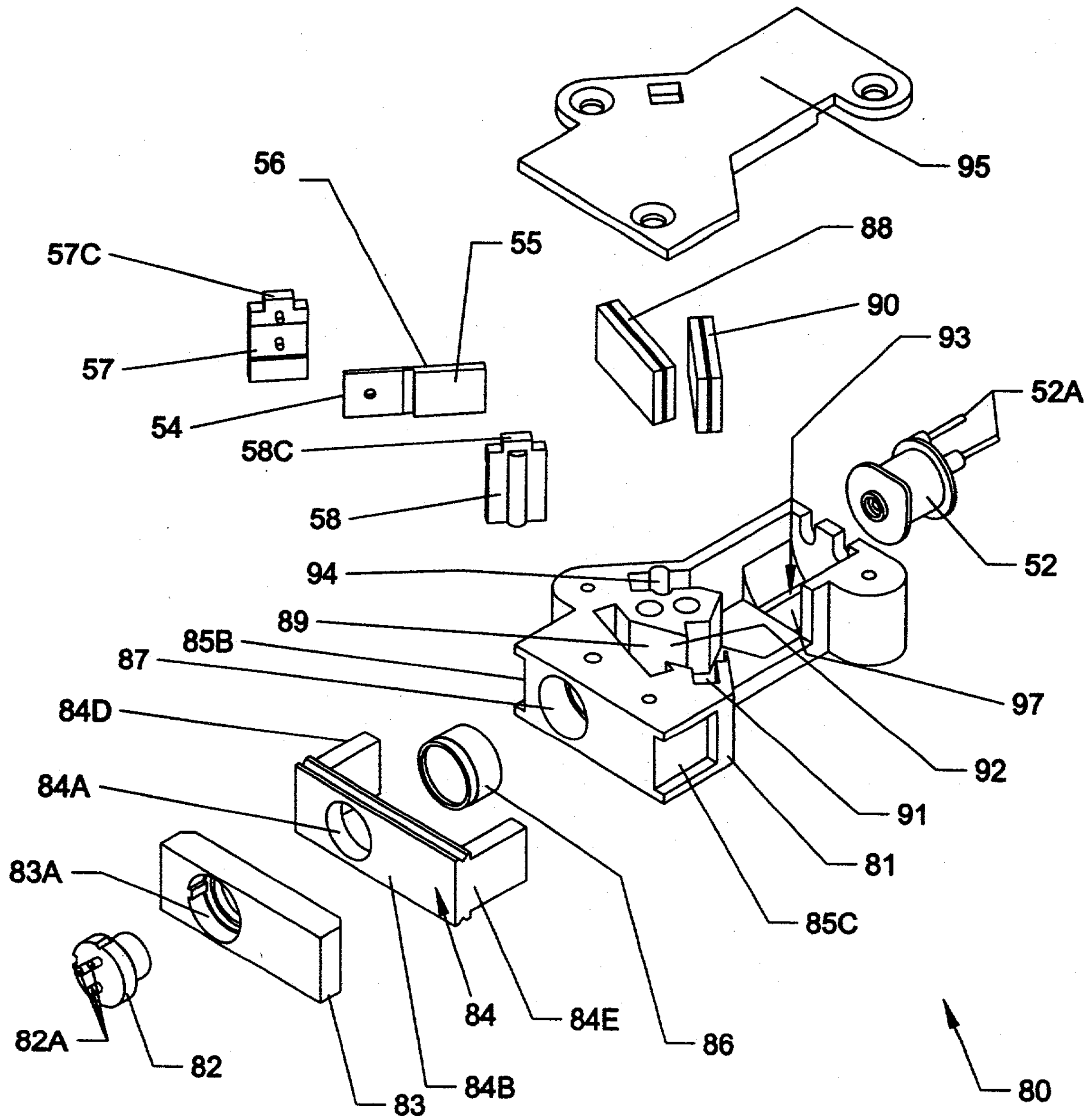
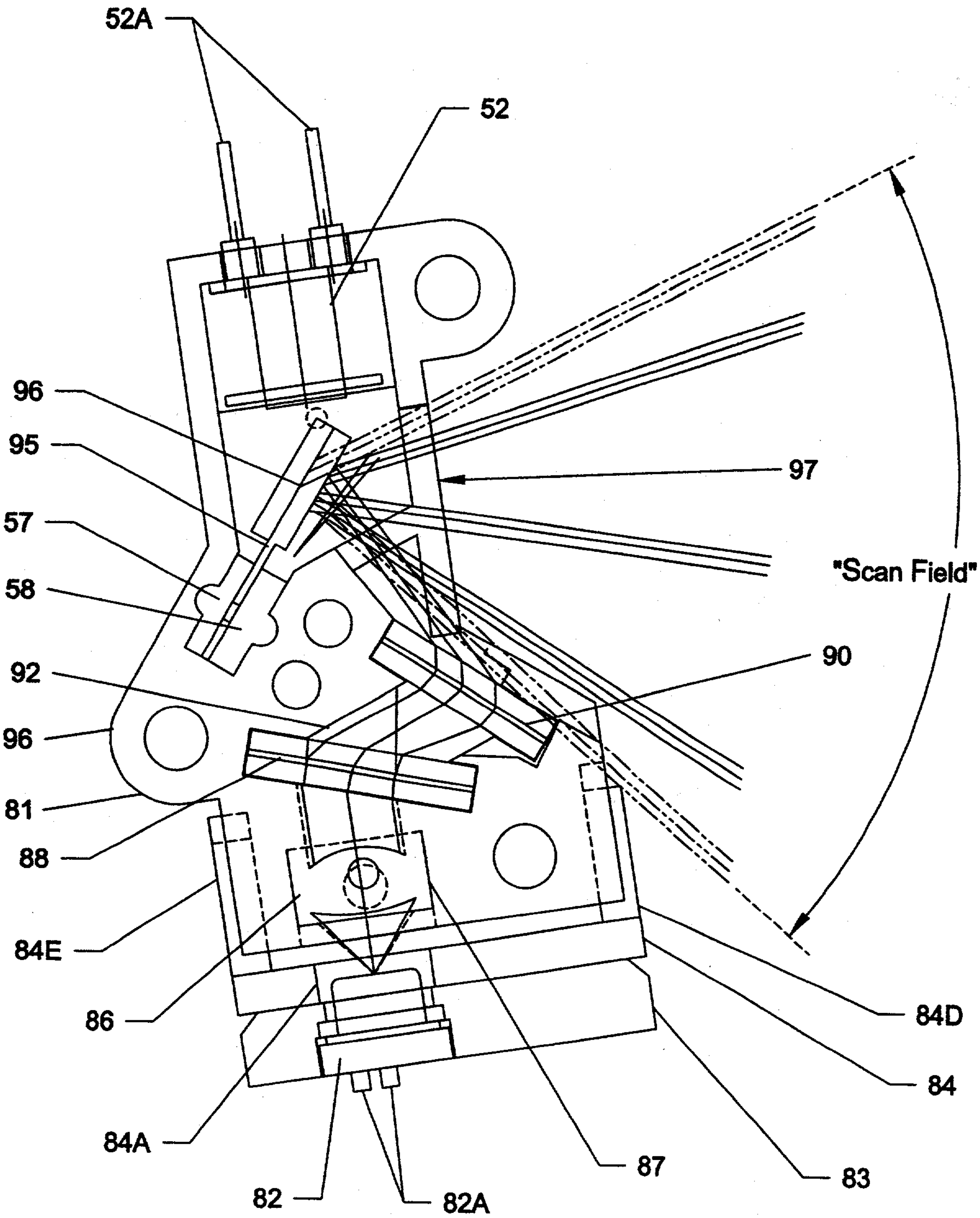

95
56
55
88
57C
90
93
52A
57
54
58C
58
52
94
89
85B
87
97
84D
92
84A
91
81
83A
85C
84
84E
86
82A
82
83
84B
80

FIG. 10B



52A
52
96
95
97
57
58
"Scan Field"
90
92
96
81
88
84E
86
84D
84
84A
87
83
82
82A

FIG. 10C

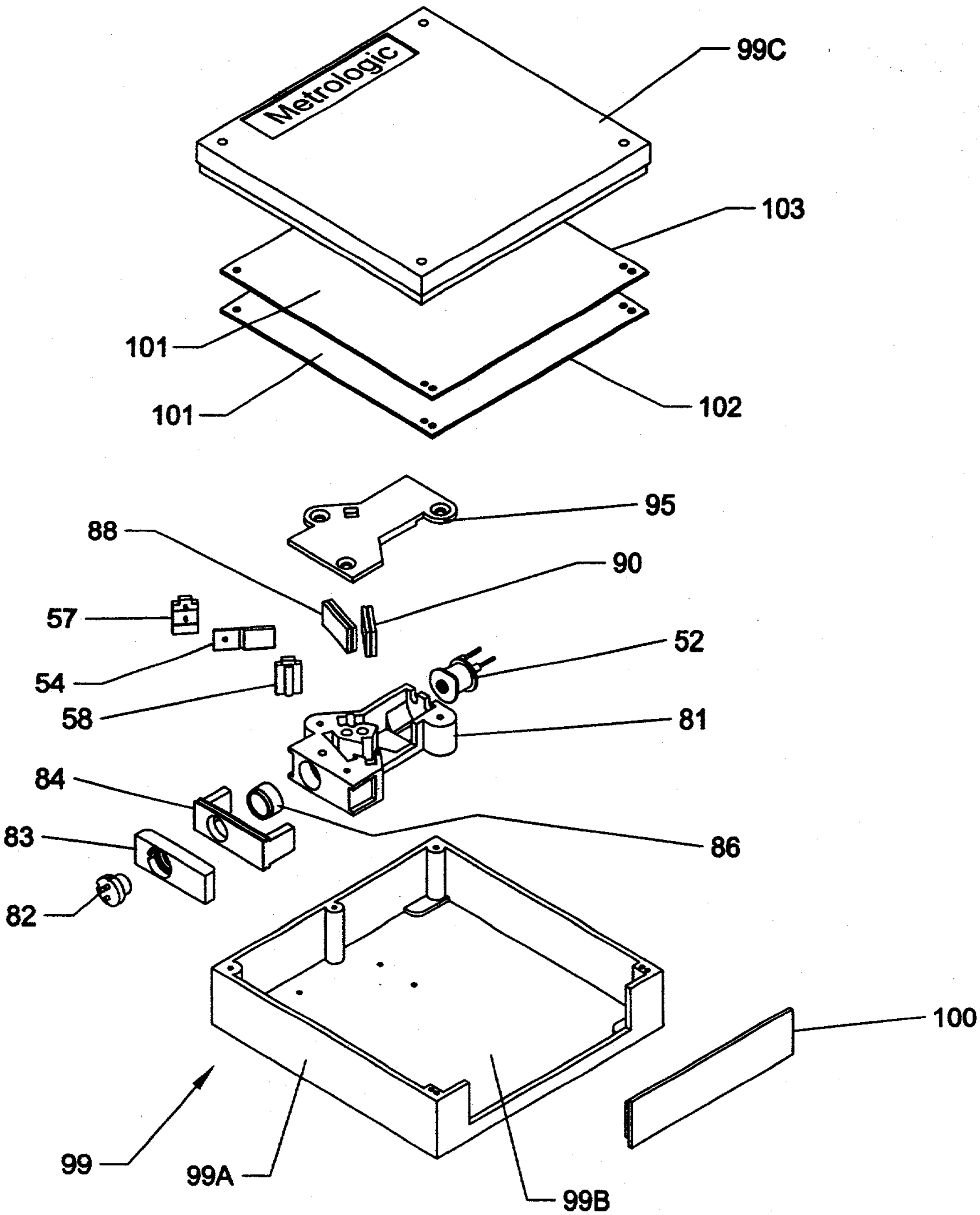

Metrologic
99C
103
101
101
102
95
88
90
57
54
52
58
81
84
86
83
82
100
99
99A
99B

FIG. 10D

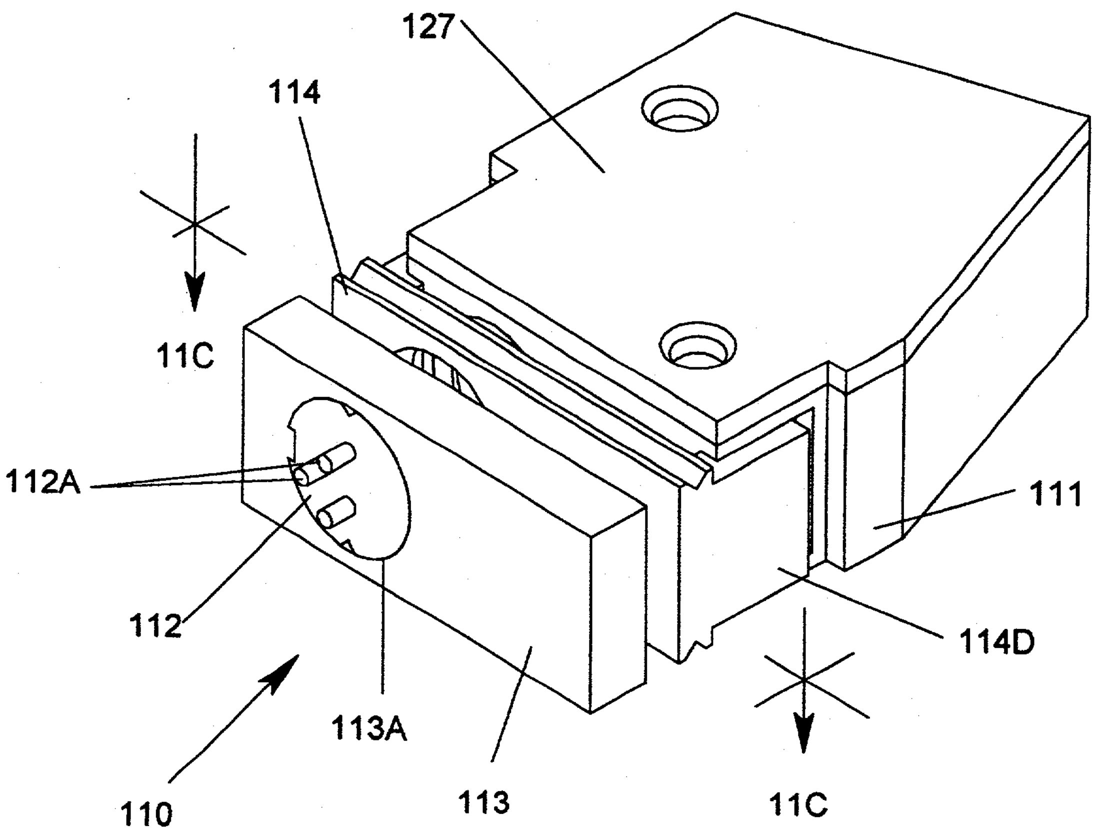


FIG. 11A

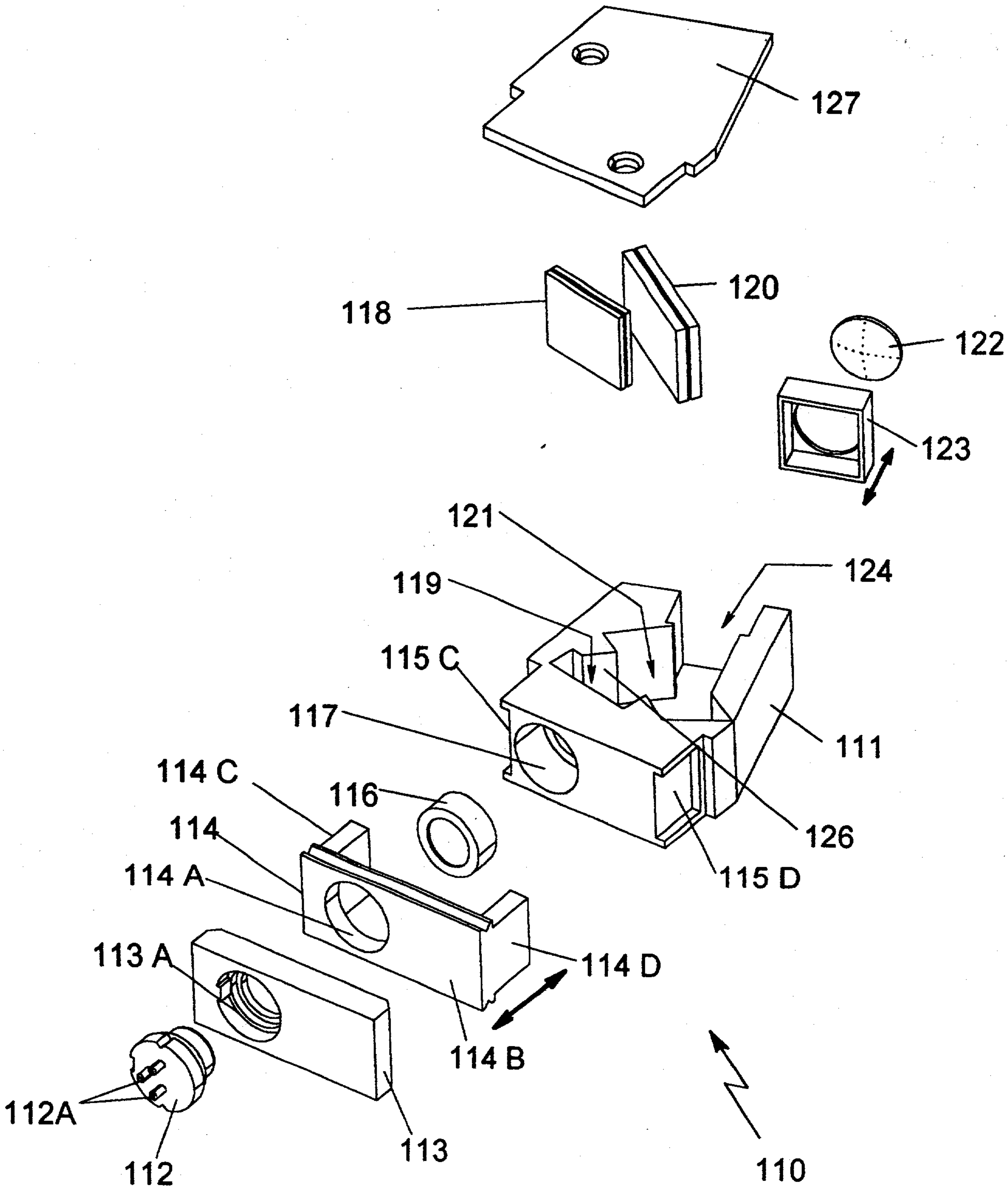

127
118
120
122
123
121
124
119
115 C
117
111
114 C
116
126
114
114 A
115 D
113 A
114 D
114 B
112A
112
113
110

FIG. 11B

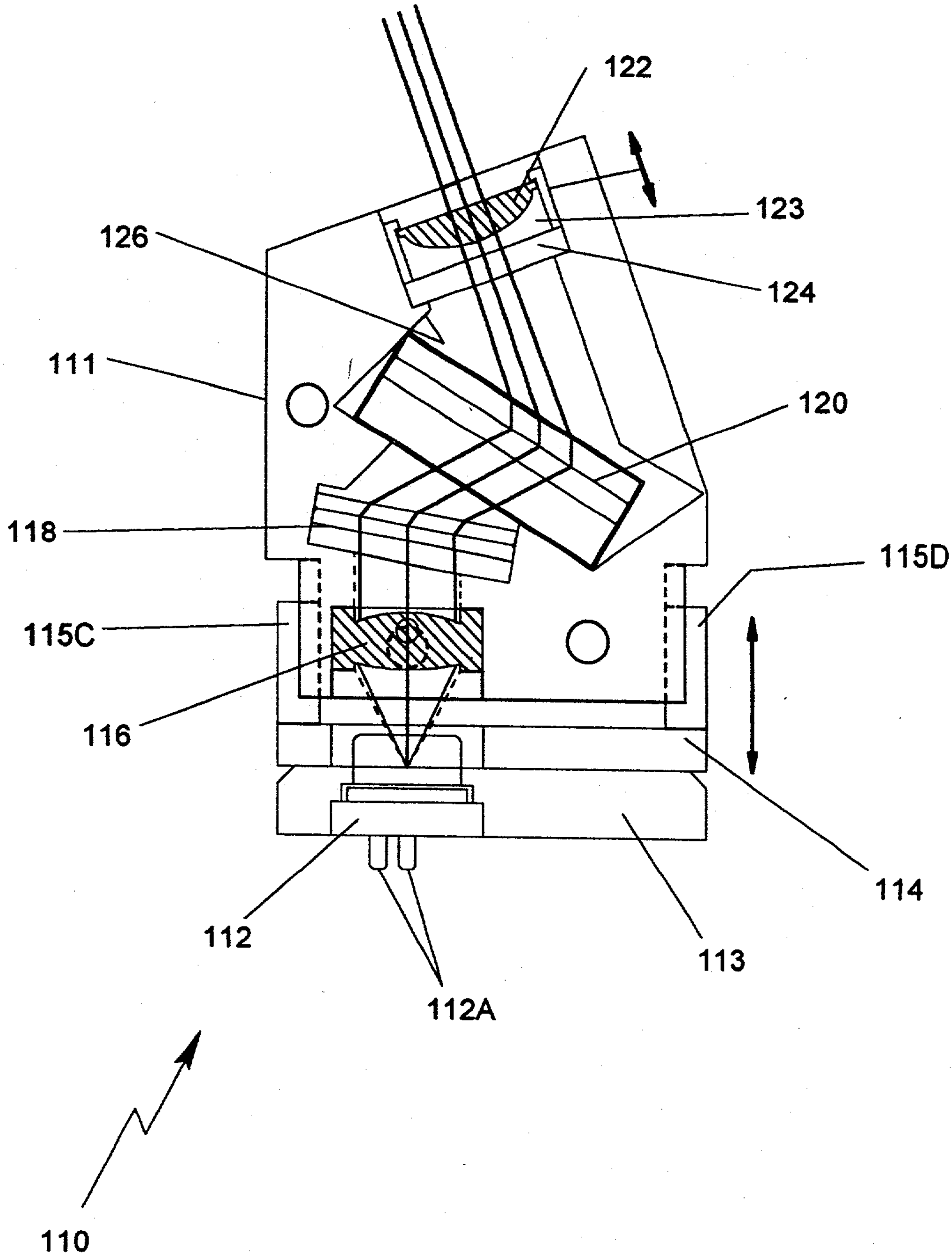


FIG. 11C

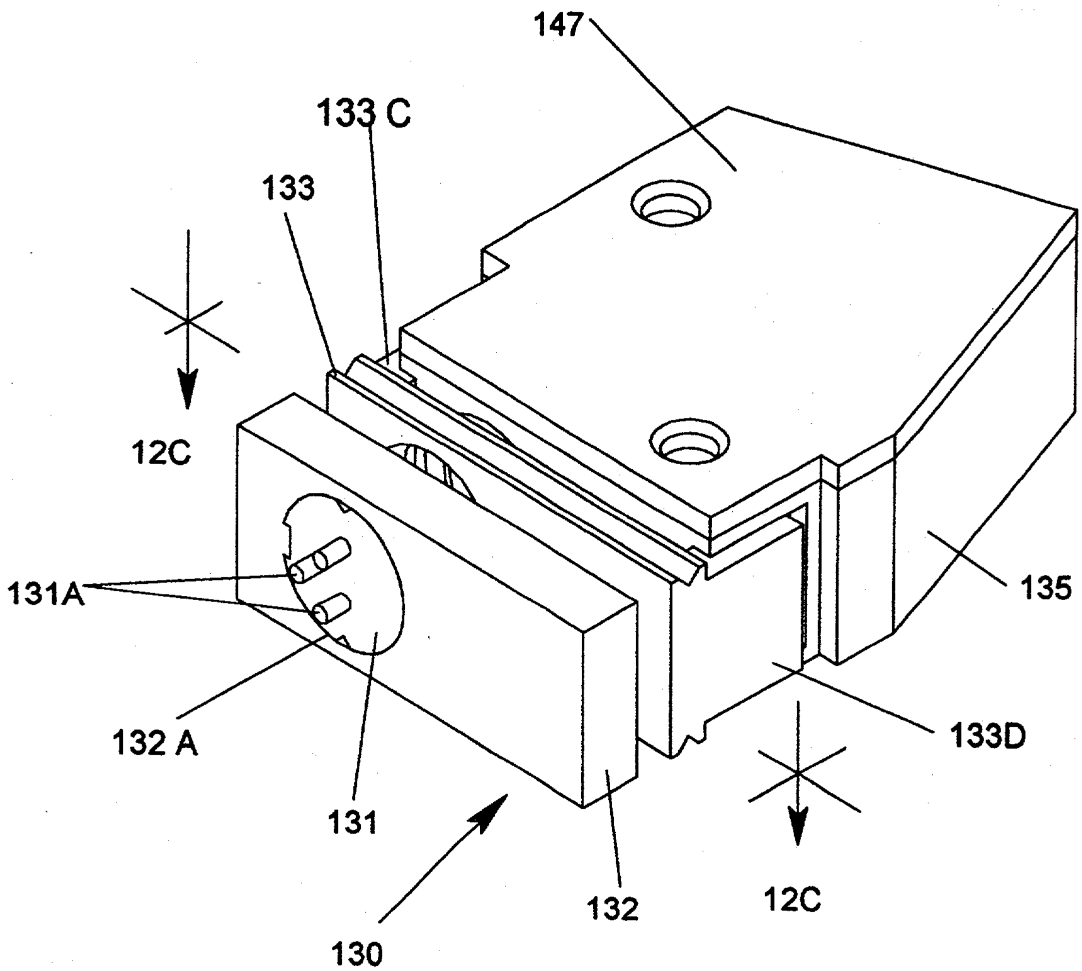
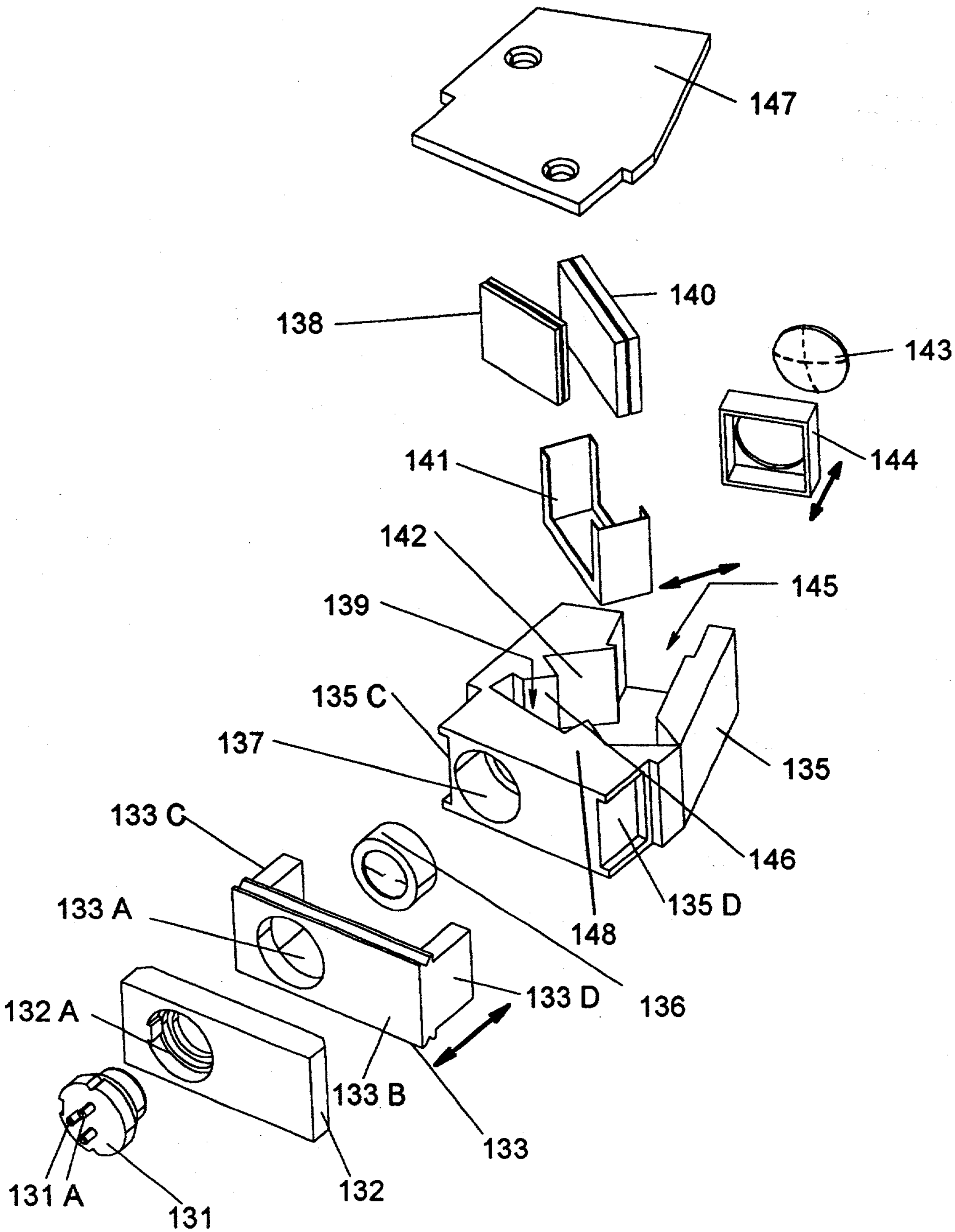


FIG. 12A



147
138
140
143
144
141
142
145
139
135 C
137
135
146
133 C
135 D
133 A
148
133 D
136
132 A
133 B
133
131 A
131
132

FIG. 12B

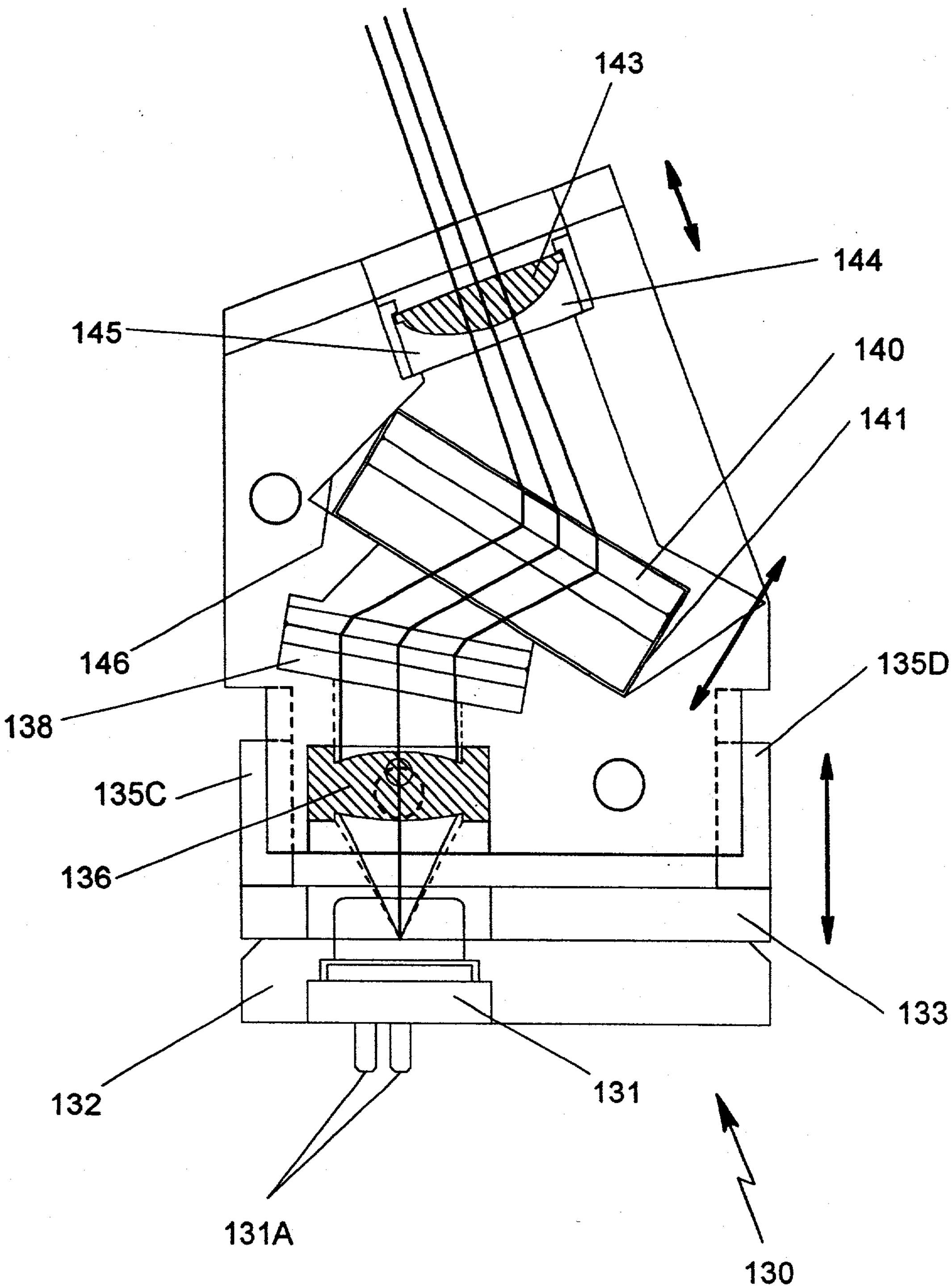


FIG. 12C

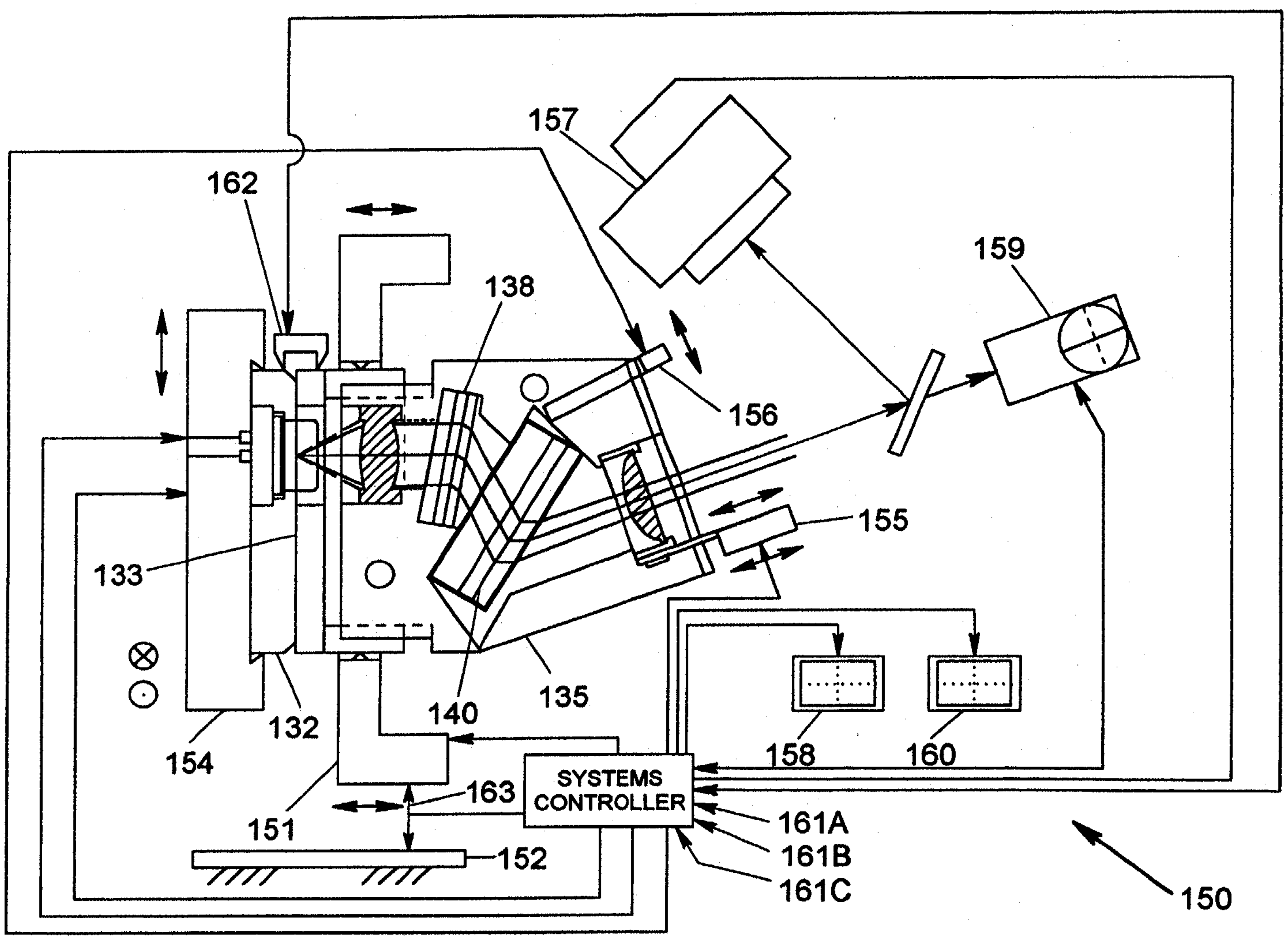

157
162
138
159
156
155
133
140
135
158
160
SYSTEMS CONTROLLER
163
154
132
151
152
161A
161B
161C
150

FIG. 13

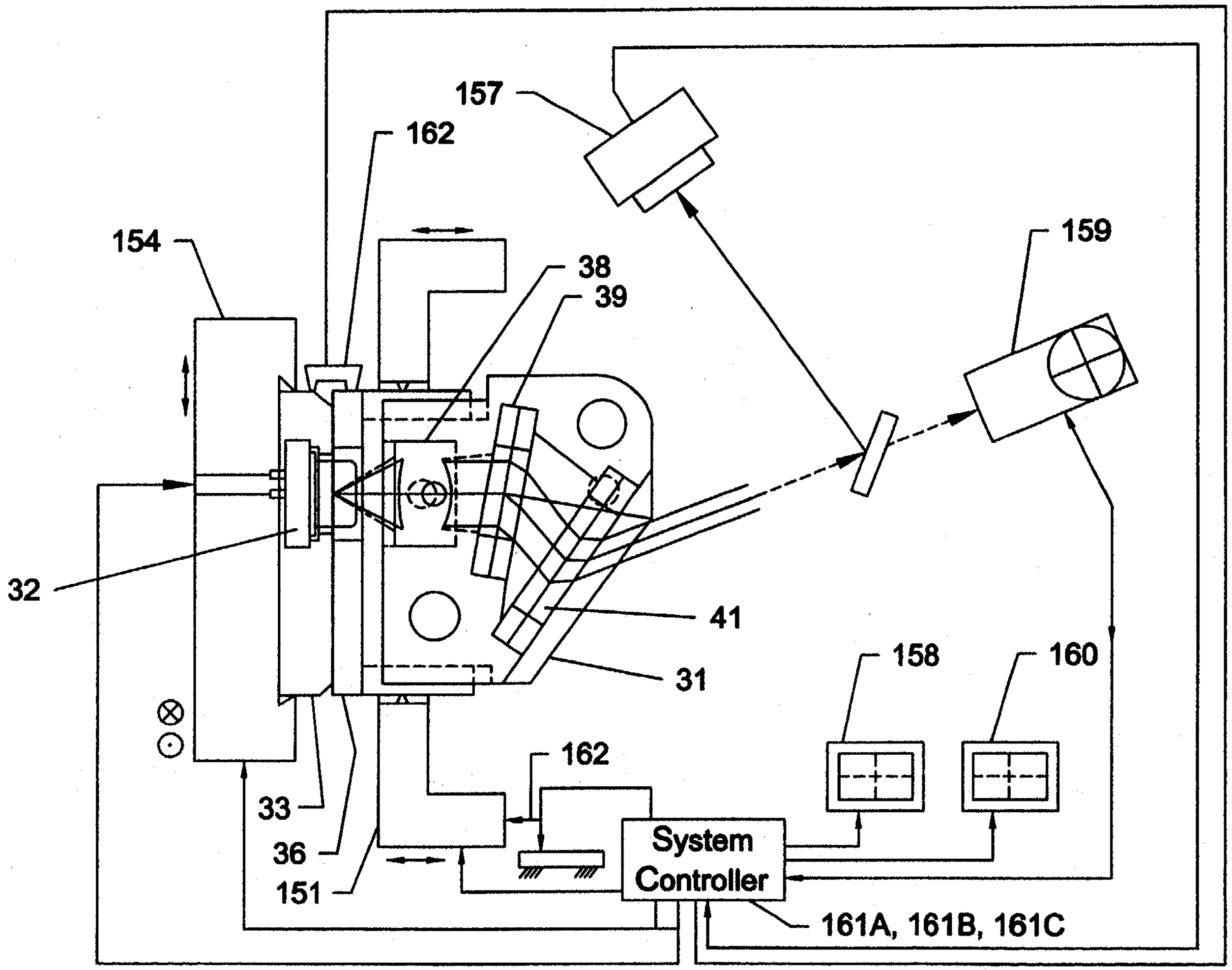

157
162
154
38
39
159
32
41
31
158
160
162
System Controller
33
36
151
161A, 161B, 161C

FIG. 14
(Case A)

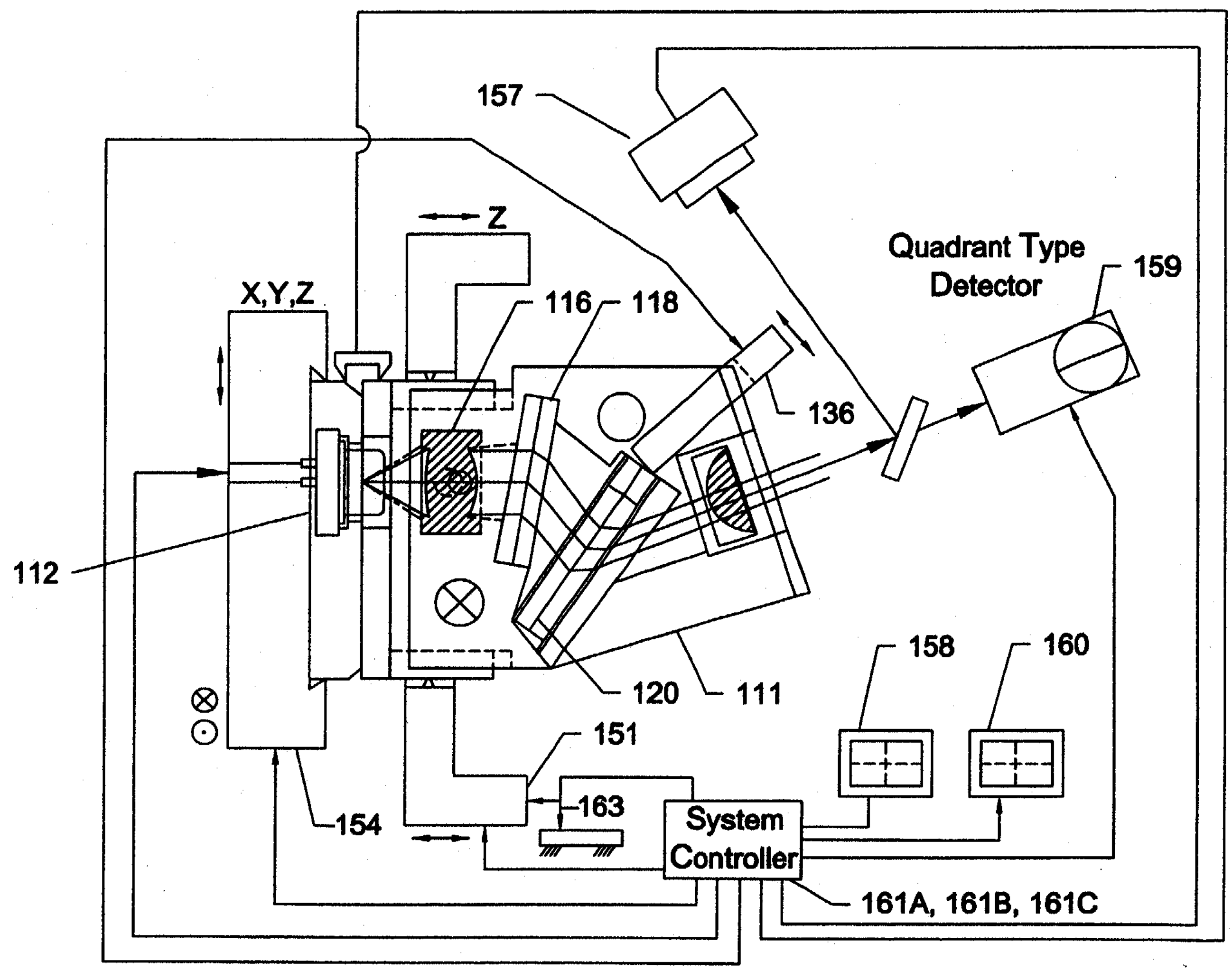

157
Z
X,Y,Z
116
118
Quadrant Type
Detector
159
136
112
158
160
120
111
151
163
154
System
Controller
161A, 161B, 161C

FIG. 15
(Case B)

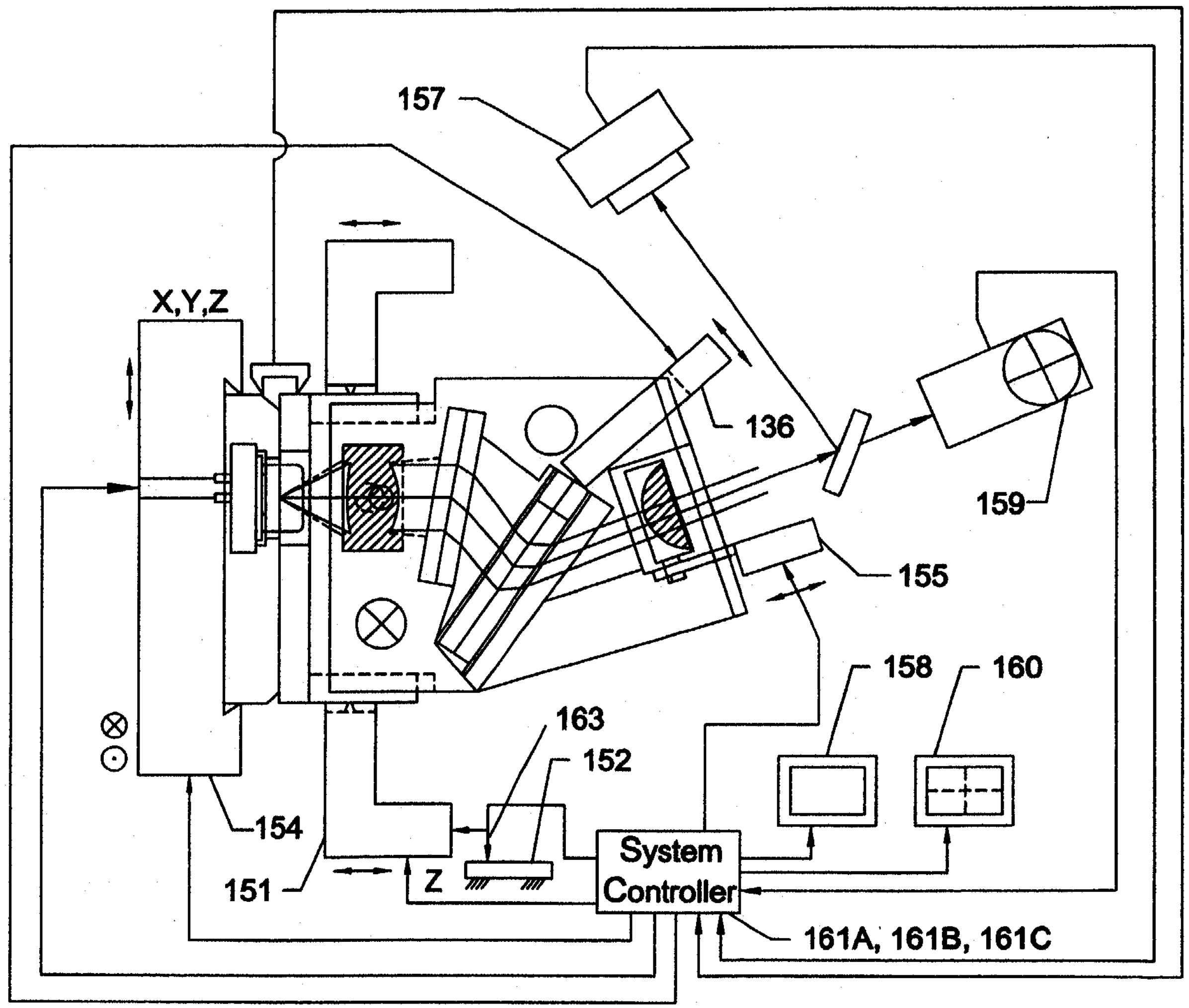

157
X,Y,Z
136
159
155
158
160
163
152
154
151
Z
System Controller
161A, 161B, 161C

FIG. 16
(Case C)

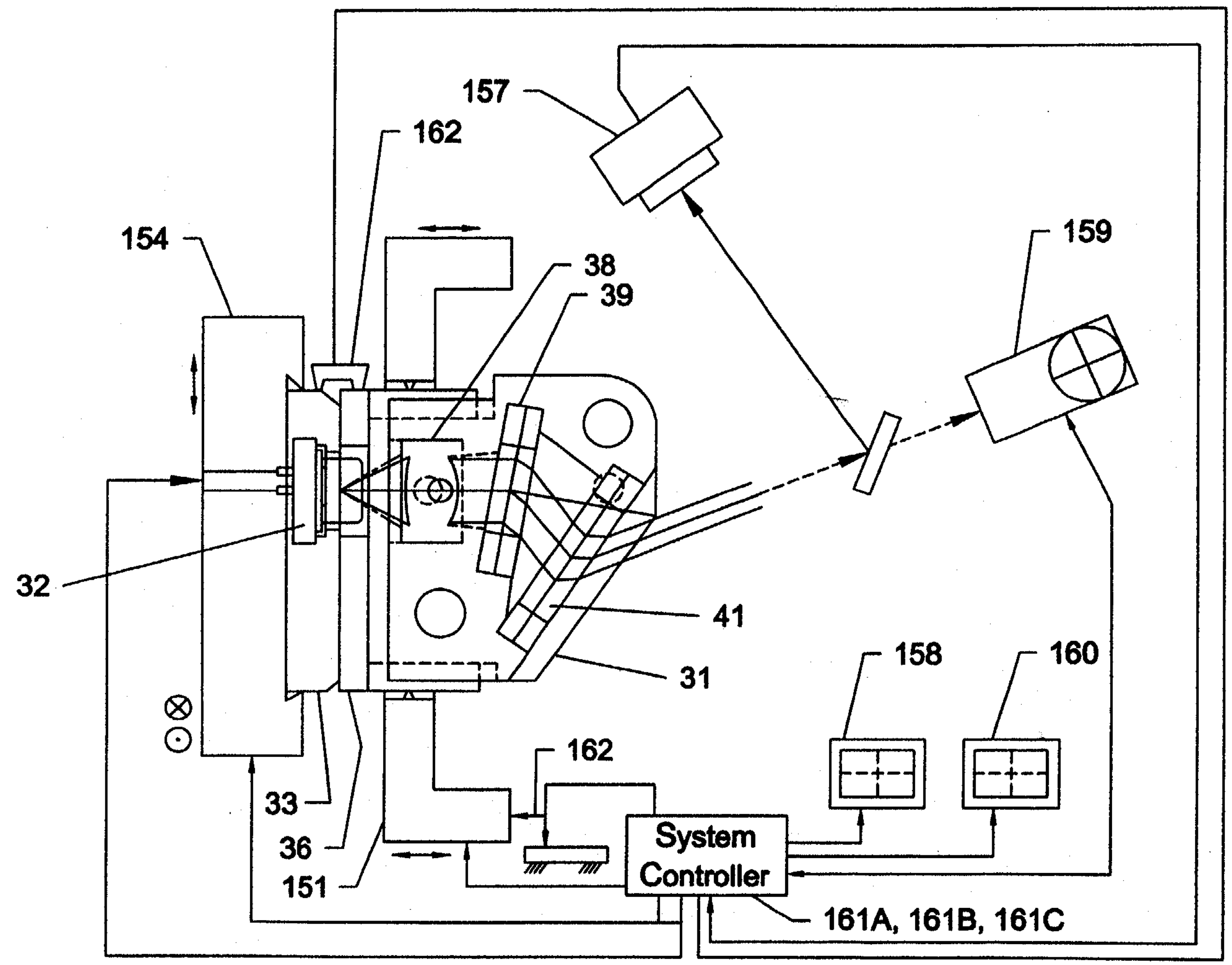

157
162
154
38
39
159
32
41
31
158
160
162
33
36
151
System Controller
161A, 161B, 161C

FIG. 17
(Case D)

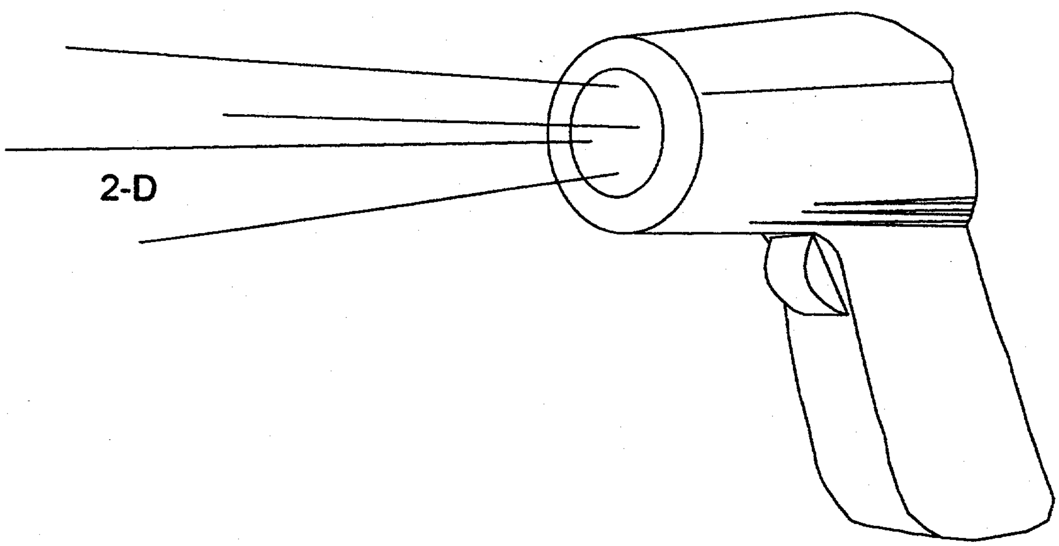


FIG. 18

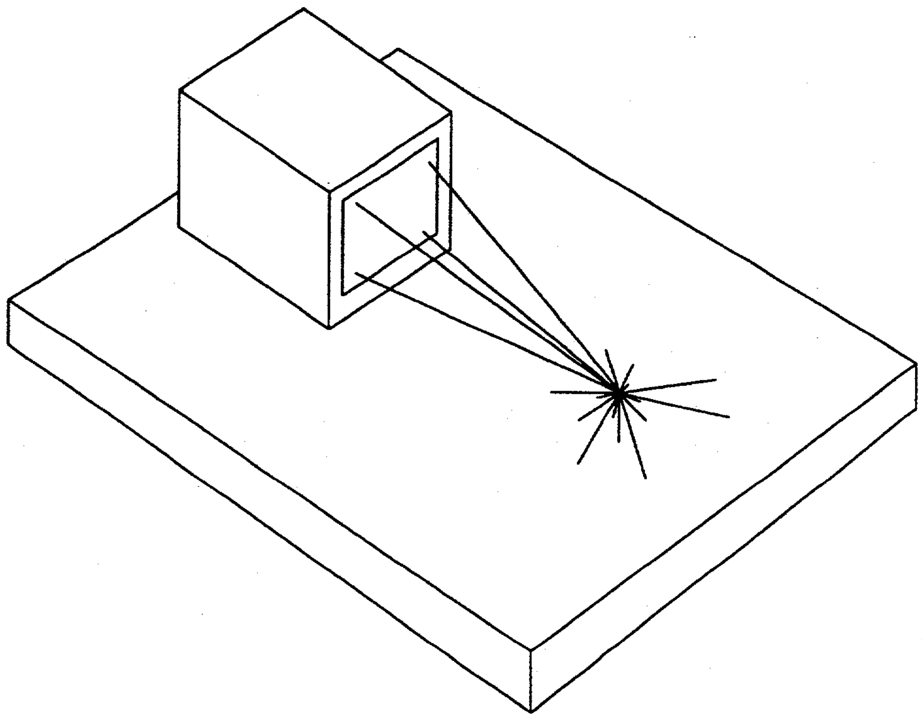


FIG. 19

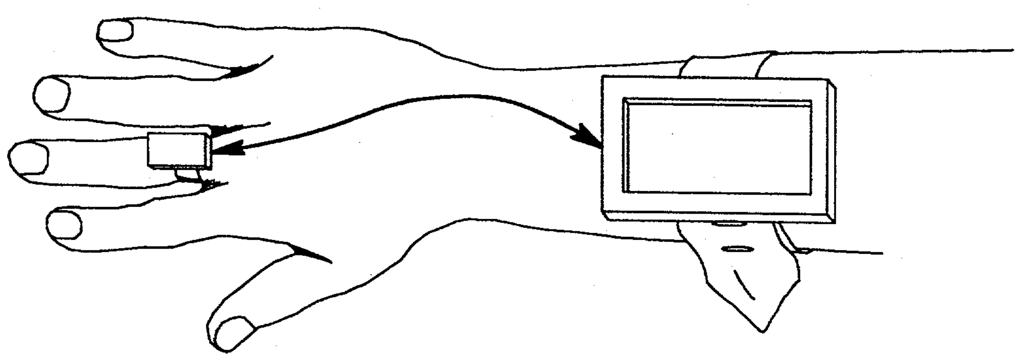


FIG. 20

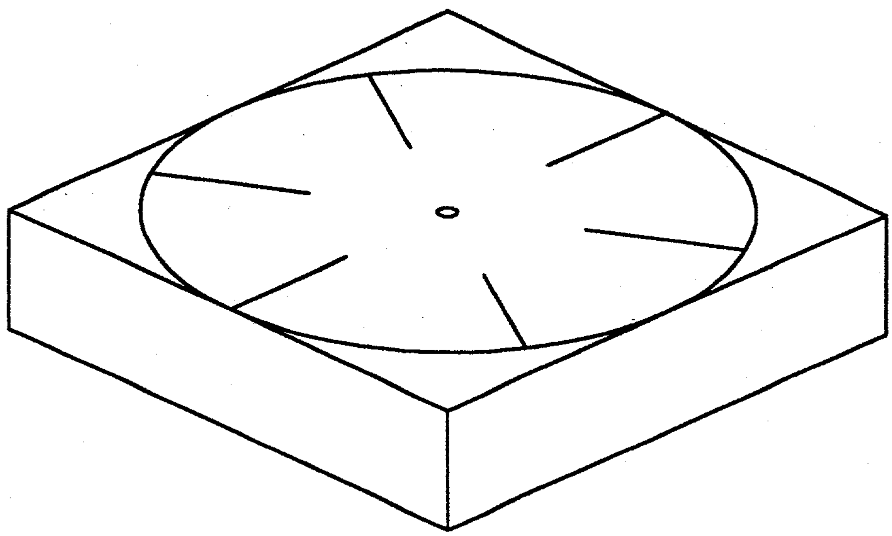


FIG. 21

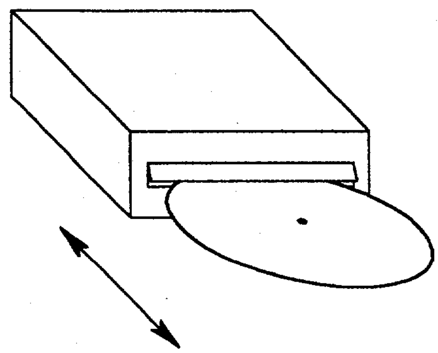


FIG. 22

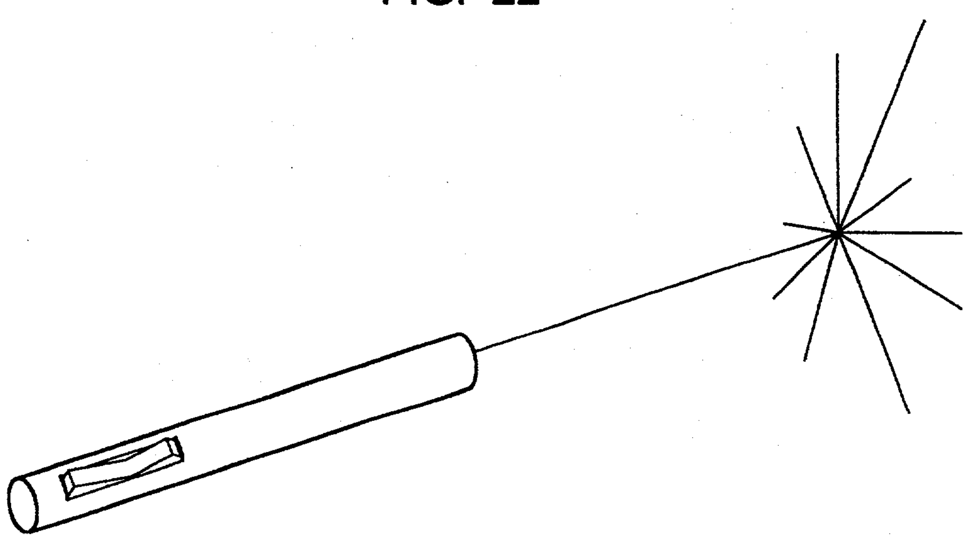


FIG. 23

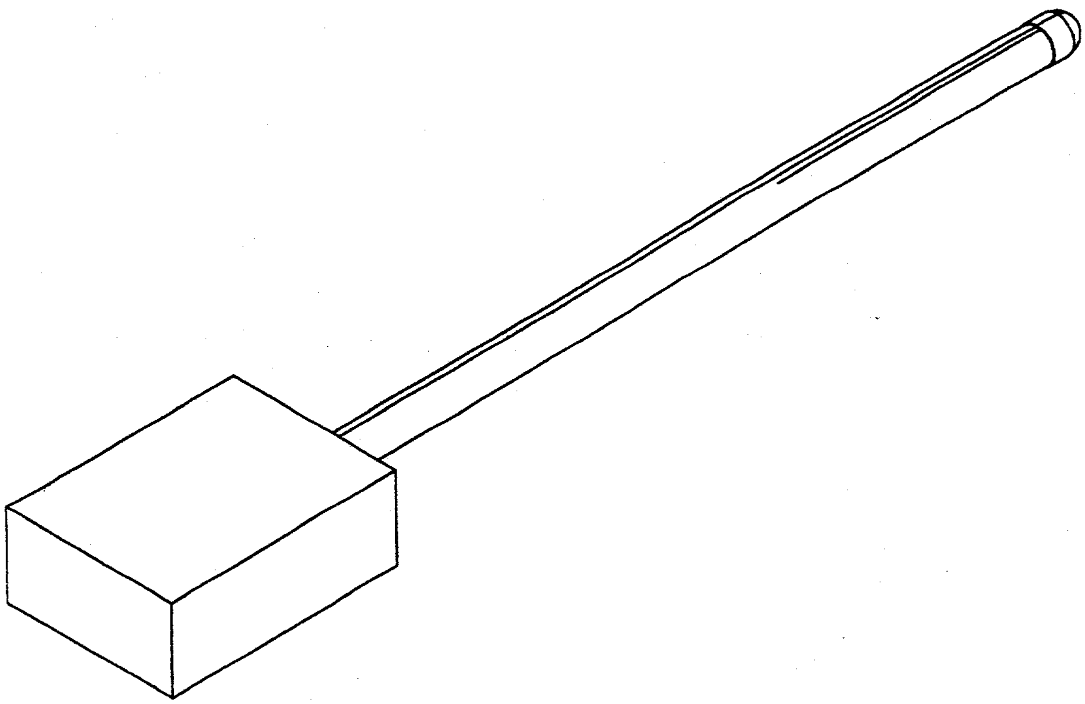


FIG. 24